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ORIGINAL COMMUNICATIONS.

(Original Communications are received with the understanding
that they are contributed exclusively to THE LARYNGOSCOPE.)

ABSCESS OF THE LUNG FOLLOWING OPERATION ON THE TONSILS AND UPPER AIR TRACT.*

DR. CHARLES W. RICHARDSON, Washington, D. C.

In a paper read before the Medical Society of the District of Columbia, March 20, 1912, on "Tonsillectomy, with Consideration of its Complications," and in another paper read before the American Laryngological Association, May 11, 1912, on the same subject, I first called to my co-workers' attention this serious complication following the excision of the tonsils.

When one considers the nature of the wound left after a complete tonsillectomy, a deep cul-de-sac between the pillars of the fauces with more or less bruised tissue dependent upon the amount of sponging, clamping and ligature of vessels, which is constantly bathed in a fluid rich in a varied flora, the wonder is not that serious infection takes place occasionally, but that such results are comparatively rare. That infections from this region, subsequent to operative intervention have been so rare has been the wonder of my experience as an operator in laryngo-rhinology, especially, also, when one considers the anatomical relationship of the tonsils with its important venous and lymphatic supply. But while these remote lesions are rare, I am convinced that they are not so infrequent as one would judge from reports hitherto made from the domain of laryngo-rhinology. In conversations with workers in this field, I

*Read before the American Climatological and Clinical Association, Washington, D. C., May 9, 1916.

have had narrated to me several cases that have occurred of septic infarct of the lung with resulting abscess which have never been reported, and wherein the condition was never recognized until the resulting pulmonary abscess had formed. Also, I have had an internist narrate a case, which had come under his observation months after the patient had been discharged by the operating surgeon.

In preparing my original papers, I was surprised at finding the small number of cases of the various resulting complications of tonsillectomy reported by operators, and this, in my mind, is largely responsible for the paucity of reported cases of this type. The reason why this complication is not more frequently reported is probably two-fold: Firstly, most operators, as workers in other fields of human endeavor, prefer to report their success, to minimize their untoward results and forget them; secondly, the serious symptoms of pulmonary infection are not always immediate, are frequently indefinite and not recognized, and the patient is discharged by the operator with the tonsillar wound healed. When the pulmonary evidences become more pronounced the internist is called into attendance, and the operator probably never hears of the untoward pulmonary complications. While the laryngo-rhinologist has apparently failed to recognize in his publications the occurrence of pulmonary abscess following tonsillectomy and other intra-nasal operative surgery, we find from other sources, the internist and general surgeon, the recognition of pulmonary abscess as a complication of tonsillectomy and intra-nasal surgery, an awakening as to the importance of this complication, with the publication of the results of their observations. During the past three years we have had several excellent papers bearing upon this most important theme by internist and general surgeons. The most important and interesting one is by Dr. Morris Manges, "The Occurrence of Abscess of the Lung After Tonsillectomy, with the Report of Nine Cases in Adults."¹ One of the most interesting features of Dr. Manges' report is that, "During the past six months six patients have been admitted to Mt. Sinai Hospital for the treatment of pulmonary abscess that has followed tonsillectomy. Such a large series of cases in such a short period deserves some notice in these days when every tonsil is under the suspicion of being a possible focal infection in so many diseases of obscure origin." And also the observation that three cases reported for treatment at Mt. Sinai Hospital for abscess of the lung secondary to tonsillectomy within a given period of six days. These three patients had been operated at the same

institution within a period of five days. All these cases were operated upon by skilled operators. Dr. Manges leaves us to infer that all of his nine cases were operated upon without the walls of Mt. Sinai Hospital. In another paper, "Pulmonary Suppuration, etc.,"² the same author states: "Tonsillectomy is occasionally the cause of lung abscess." Dr. Charles L. Scudder, in an article entitled, "A Report of the Cases of Lung Abscess at the Massachusetts General Hospital Clinic,"³ states: "Attention is attracted to lung abscess following tonsillectomy. There have been several cases in my experience. There is one case in this series which followed operation upon the nasal septum."

If nine such serious complications of tonsillectomy came within the medical wards of a single hospital within a year, how many must be the aggregate coming within the wards of the many hospitals throughout the civilized world wherein tonsillectomy is performed?

The causation of pulmonary abscess secondary to tonsillectomy is in all probability through embolism or infection of the lung. At the time of the operation a large number of veins are opened and these may remain patulous for several days. Septic clots or septic material may thus be carried into the lungs. The character of the onset would lead one to conclude from a clinical point of view that the septic infarct more readily explains the etiology. The view is also held that they are due to the inspiration of infected blood or pieces of tonsillar tissue. While aspiration of tonsillar blood, which contains cheesy concretion, may play a role in a certain percentage of cases, the blood from tonsillectomy is not usually infected blood, and in the modern operations for tonsillectomy, there should be no pieces of tonsillar tissue to aspirate.

The onset of a pulmonary septic infection after a tonsillectomy or other naso-pharyngeal operative procedure is fairly characteristic, although frequently overlooked. The progress of the case for several days follows the usual post-operative course of such cases, indeed, may progress for a week or more, without marked untoward symptoms being manifest. The earliest symptoms are return of fever, septic in character, pain in the chest, and violent coughing. The physical signs at this period are very meager, depending on the size and location of the area involved. The physical signs present at this stage may be dullness over the area affected, diminished breath-sounds and crepitant or subcrepitant rales. With the development of the abscess, we have characteristic symptoms manifested, viz., the expectoration of pus, pain, hemoptysis and foul

odor. In the early stages the odor is only noted by the patient, who constantly refers to the foul, unpleasant odor at coughing; and the sickening, sweetish taste of the expectorate. In the several cases which I have had under my observation the odor of the breath was never noticed as disagreeable, although the expectorate from the same patient had a distinct, unpleasant odor. The cough persists, the fever becomes distinctly septic, the fingers club and the patient gradually loses flesh. The physical signs at this stage are those of lung abscess.

On June 10, 1909, I operated upon a vigorous, rather large man, 45 years of age, for the removal of both tonsils. The convalescence was slow. A moderate fever continued for six days. On the seventh day the patient returned to his home and was lost sight of by me for nearly ten days, although under the constant care of his family physician. When I saw him again in consultation, I found the patient a very ill man. He was running a septic temperature, coughing constantly, complaining of great pain at the base of his right lung and presented a very anxious and distressed countenance. A slight area of dullness, diminished breath-sound, with some moist rales could be made out over the base of the right lung posteriorly. Before I saw him again he was taken to his home in a distant state. Several weeks later I heard from his wife, that the evidences of pulmonary abscess had fully developed. He was operated at the Mayo clinic; the abscess was drained, with a complete recovery.

In December, 1911, I operated upon a young married woman, 24 years of age, for hypertrophied tonsils. The operation was simple in procedure, with very little hemorrhage. The patient's throat was unusually sore for several days and the convalescence was slow. Ten days after the operation she developed a severe cough, intense pain in the upper lobe of the right lung, with a septic temperature curve. Physical signs were absolutely negative. On the thirteenth day, the cough, paroxysmal in character, was more annoying. She now began to expectorate a large quantity of purulent, very offensive secretion, and complained greatly of an intensely offensive odor whenever she coughed. Examination of the sputum, which was very offensive in odor, demonstrated it to be made up largely of pus cells. The infecting organism was found to be streptococcus. Physical signs demonstrated a small consolidation between the second and fourth rib on the right side with small mucous rales. On the fifteenth and sixteenth days she again had great pain in the upper portion of the right lung. This pain recurred again on the twentieth day of illness. The patient made a complete recovery in the course of four months.

While preparing this paper, the following case came under my observation:

On March 22, 1916, I operated upon E. E. S., 26 years of age, for very large tonsils. The operation was without incident, excepting for the necessity of ligating a vessel on the left side and for a bleeding on the right side which was apparently controlled without ligation. At 7:30 p. m., the same day, I was notified that the patient was bleeding quite freely, and that a great swelling had formed in the right side of his throat. On arriving at the hospital, I found that my patient was bleeding too freely from the right tonsil, and that the tumor referred to was a large blood clot that had formed in the rather deep tonsillar fossa. As the patient could not control himself, and as the throat was very tender, I concluded that it would be useless to make any attempt to control the hemorrhage excepting by placing the patient under a general anesthetic. Ether was administered, the clots removed, and efforts were made to tie the vessel. This effort was futile, as all ligatures tore through the muscles, so I was obliged to pack the cavity and suture the pillars over the packing. The following day the pillars were released and the packing removed. On the second day the patient complained of some soreness in the middle lobe of the right lung. As the patient's temperature was normal, he was discharged from the hospital March 25. From March 25 to March 30 there was no incident in the case; the patient reporting every alternate day at my office for local treatment. During this period his temperature had shown no elevation. From the fact that throughout this period he had on several occasions spoken of the pain in the upper portion of right lung, I was lead to anticipate the impending issue, although the freedom from fever, as late as March 30, the time of his previous visit, and the existence of only a moderate cough had given me a slight hope that I was being influenced by the thoughts of this paper. On April 3, he reported to my office, stating that he felt worse. The temperature was 101. He stated that since he had seen me the pain in the upper portion of his right lung had grown worse, he had had frequent paroxysms of coughing, with a copious expectoration, and a foul odor whenever he coughed. Examination of the chest showed a flatness over the right infra-clavicular region, and I then elicited the history that several years ago he had a severe double pneumonia. A small area of dullness of fan-like formation, with the apex at about the third rib, and extending outward with the base towards the axilla, between the second and fifth ribs was demonstrated. The breath sounds were broncho-vesicular over this area

and small rales were noted. The patient was ordered home to bed. From the description of his sensations there was no doubt that his temperature must have been quite elevated the evening of March 30, as well as on each subsequent day. His maximum rise of temperature April 4, 5 and 6 was 102.3. During the night of April 6, the patient was aroused by a violent paroxysm of coughing, which was attended with the expectoration of a large amount of foul pus and some blood. The copious expectoration was no doubt the evacuation of the abscess cavity. April 7, patient appeared entirely

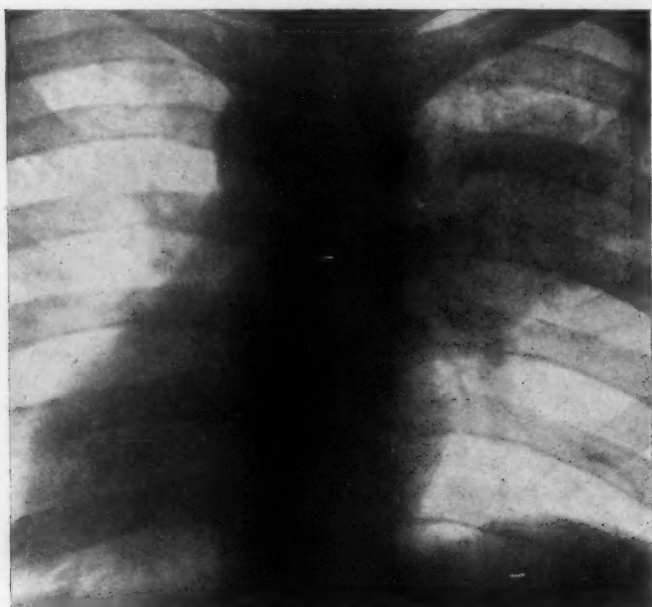


Fig. 1. Radiograph showing lung abscess.

changed for the better; no fever. Return of appetite. Physical signs markedly improved. Breathing faintly broncho-vesicular with a peculiar rasp at termination of expiration. April 8, improvement continued, no fever; physical signs of lesion less clearly defined. April 9, patient's condition still better. At office to permit of examination by Dr. Claytor. April 11, as no physical evidences of abnormal condition could be detected, as temperature had now been normal for five days, and as patient stated he felt perfectly well, he was discharged from further treatment. X-ray plate of chest was made April 8, 1916.

Two other cases with which I have been intimately associated, and which I had under my observation as consultant will not be reported in this summary as they form the subject of another paper to be read before you this day.

One of the objects in presenting this paper to you is for the purpose of again calling to the attention of the profession the fact that the performance of tonsillectomy is not the simple, innocent surgical procedure that the laity and many of the internists seem to consider it. To again call to the attention of the profession that many immediate and some remote serious accidents or sequelae may be brought about through the performance of this operation that may endanger the welfare and even the life of the patient. I do not question that these sequelae and complications may at times be due to want of skill and technique but firmly believe that more frequently they are beyond the control of the operator and wholly independent of the care and attention paid to the post-operative management of the case.

When one considers the serious character of this form of complication, and the many others that may beset the path of the patient who is to undergo tonsillectomy, are we justified in considering it in so lightly a manner as we have in the past? Should we not weigh more carefully the evidence brought forward against the tonsil as the possible source of a remote infection, eliminating most thoroughly all the other possible sources of infection, before the tonsils are consigned to the surgeon for removal. The tonsils are so patent, they can be so easily examined and so readily condemned, according to the various standards that constitute a diseased tonsil, and thus apparently logically connected with the remote infection.

While at times the results attained are brilliant in the excision of the tonsils, for remote infection, do we not also find that many times the results are not compensatory for the risk through which the patient passes? We should always consider in cases wherein there is a reasonable doubt as to the tonsils being the organ at fault whether the danger the patient is accepting through the tonsillectomy outweighs the importance and danger of the remote infection which it is sought to remove.

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- 1317 Connecticut Avenue.

LUNG ABSCESS FOLLOWING TONSILLECTOMY.*

DR. CORNELIUS G. COAKLEY, New York City.

The Fellows of this Section, and the medical profession in general are to be congratulated that Dr. Manges has so ably brought to our attention this series of cases of lung infection following tonsillectomy. The distinguished reader of this paper is surely no more interested than the laryngologist to ascertain the cause or causes and to so perfect the operative technic as to minimize this serious complication. Those of us who are working in the field of laryngology are glad to know that so distinguished an internist regards a tonsillectomy as a major operation. We regret that at the present day few physicians or surgeons regard it as such, or have a proper appreciation of the difficulties and dangers of a tonsillectomy. Dr. Manges discusses the etiology of this complication under the following heads:

First. Anesthesia.

Second. Aspiration of (a) Infected Blood; (b) Pieces of Tonsillar Tissue.

Third. Embolism or Infarction.

Fourth. Some Special Infective Agent.

Fifth. Some Antecedent Cause, Either Local or General.

First. Anesthesia.—I agree with Dr. Manges that it is not due to the anesthetic.

Second. Aspiration of (a) Infected Blood; (b) Pieces of Tonsillar Tissue.—These are considered by Dr. Manges the most important causes. I would go even further and say probably the sole, direct cause. As an operator I would suggest a somewhat different concept of infection to that of the reader of the paper. Dr. Manges states that Dr. Yankauer has bronchoscoped, "but he has never found any pieces of tonsillar tissue or blood in them." The operation of tonsillectomy when properly and skillfully performed removes the tonsil *en masse*. The tonsil is not removed piecemeal, and there should be no pieces of tonsillar tissue to get through the larynx into the trachea and bronchi to infect the lungs. What *does happen* in practically all cases is this: The thick, cheesy or thin, milky, bacteria-laden secretion within the tonsil is expressed out

*Discussion of Dr. Morris Manges' paper on "Lung Abscess Following Tonsillectomy: Report of Nine Cases," (an abstract of which appears on page 1056 in this issue), read before the Section on Laryngology and Rhinology, New York Academy of Medicine, Jan. 26, 1916.

either when the tonsil is seized by a forceps, as in the dissection method, or as the tonsil is pushed through the fenestrum of the tonsilotome as by the Sluder method. This bacteria-laden secretion, if cultured, contains almost invariably streptococcus viridans and frequently *S. hemolyticus*, pneumococci, staphylococcus aureus; each of these organisms is capable under suitable conditions of inducing localized abscesses in the lungs or elsewhere. This infected material is usually forced out of the tonsil into the pharynx in the *first stage* before any bleeding occurs. Unless this infected material is caught on a sponge and prevented from mixing with the saliva in the pharynx, it may be aspirated then, or later mixed with the blood and aspirated. I believe that the bronchoscope would not detect any blood in the lungs several days after tonsillectomy, even if the blood carried the infective material for abscess formation. The coloring-matter would have disintegrated and been absorbed, and the fibrin, too, in all probability.

Third. Embolism or Infarction.—I cannot believe this to be the factor in the production of a single small abscess. If the condition simulated pneumonia with gangrene supervening, one might suspect multiple foci of infection with general consolidation like a pneumonia, as probably due to infection getting into the venous circulation, through the plexus of veins around the capsule of the tonsil.

I have never seen open veins after any tonsillectomy as reported by Yankauer. I suspect they are open if there is any bleeding. After checking all the bleeding, I frequently see veins, some with circulating blood, others containing thrombi, but *none open*. Neither can I understand the absence of that thick, whitish exudate that appears about twenty-four hours after the operation, covering thickly all the tonsillar fossa, and hiding from view all the underlying structures, including the veins.

Fourth. Some Special Infective Agents.—If five cases came from any institution in the short time mentioned, and especially from different operators, I would suspect some temporary fault in the operating-room technic.

Fifth. Some Antecedent Cause—Local or General.—This I believe to be an important factor but one that will always be hard to evaluate, unless we insist on having a most complete physical examination of every case to be operated upon. I am free to confess that this is not done in my private practice. It has only been done in a few ward patients operated on at the Rockefeller Institute, or that have entered the wards of the Presbyterian Hospital, seeking relief for arthritic diseases or valvular cardiac diseases.

The majority of our private patients are referred to us by physicians. The routine examination before operation is for the family physician to examine the heart and lungs, usually without stripping the patient, examine the urine for albumin and sugar only, and pronounce the patient a good operative risk. Does Dr. Manges consider that the average private patient is properly examined before his tonsillectomy, so that the physician can exclude a small tubercular area in the lung which might be easily infected by the bacteria in a diseased tonsil?

Now as to the operation of tonsillectomy which Dr. Manges believes to be performed so much better on private patients than in our institutions. I think it safe to say that Dr. H. R. Allen of Indianapolis was given all of the care that possibly could have been given to a patient, yet he developed pneumonia after his operation.

Dr. ———, a distinguished internist of New York, was tonsillectomized, yet developed a streptococcemia and died a few days later of general septicemia. Barnes reports a death from streptococcemia following operation on a peritonsillar abscess. The complications following operation of private patients are, unfortunately, seldom reported, as are the cases which are admitted to hospitals, so we imagine these complications do not exist. Had some of these cases reported by Dr. Manges, viz., No. 3, No. 4, No. 6, No. 8, occurred in the private practice of the average practitioner, they would probably have been diagnosed as ether pneumonias and have recovered, not needing any surgical treatment, without having had the advantage of the excellent diagnostic facilities afforded at Mt. Sinai Hospital. We should like to have Dr. Manges tell us what in his estimation should constitute an adequate physical examination preliminary to tonsillectomy.

As to the choice of methods for performing tonsillectomy this must be left to the individual operator.

The operation of tonsillectomy if performed under general anesthesia should, in my opinion, have a trained corps of workers, each doing his part of the work, just as in any other well-conducted surgical procedures.

First. A trained anesthetist to carry the anesthetic to the full abolishment of the pharyngeal reflex.

Second. A trained assistant to prevent septic material from escaping from the tonsil into the pharynx, and to keep the pharynx dry or free from blood, during the operation.

Third. A skilled operator provided with good light to see accurately the operative field, and that *field kept free from blood.*

Fourth. All bleeding stopped from the fossa from which the first tonsil was enucleated, before beginning the enucleation of the second tonsil.

Fifth. All bleeding from the second tonsillar fossa stopped before extirpating the lymphoid tissue in the naso-pharynx, or considering the operation ended.

That tonsillectomies may be safely done in the presence of severe streptococci infection has been proven by Barnes of Boston, who reports having successfully enucleated ten pairs of tonsils during an attack of peritonsillar abscess.

About four years ago when the physicians of the Rockefeller Institute were studying scarlatina, I performed several tonsillectomies in children and adults convalescing from scarlatina, who were still running temperatures, and some having a mild nephritis, and none of them had any complication. Their recovery differed in no way from that usually seen.

With such care employed in operating, I feel sure that there would be fewer complications, and that much better cosmetic results would ensue.

It is not necessary for patients to remain in a hospital four or five days after a tonsillectomy, unless complications follow.

53 West Fifty-sixth Street.

Observations on Gunshot Wounds of the Head. COL. H. N. W.

GRAY, *British Medical Journal*, Feb. 19, 1916.

The following principles and practice are followed by the surgeons at work in certain of the military hospitals of the present war.

Infected gunshot wounds of the skull and brain require more careful consideration and prompt attention than similar wounds of any other part.

Sepsis can best be combated and prevented by early and complete operations.

Permanent disability can in most cases be prevented by systematically removing foreign material or displaced bone from the surface or substance of the brain whenever these are accessible to legitimate surgery.

Following these principles the immediate results and the saving of life and rapid restoration of function are better than those obtained by more conservative procedures.

STEIN.

INDICATIONS FOR THE LABYRINTH OPERATION WITH REPORT OF THREE CASES OF MENINGITIS.*

DR. CHAS. E. PERKINS, New York City.

There seems to be practical agreement among aural surgeons in regard to the treatment of certain forms of labyrinth disease. This is the case in circumscribed purulent labyrinthitis where nature has been able to limit the process to one part of the labyrinth. If encountered during operation these fistulae are to be let alone. To use the probe upon them with the view of gaining some information or the curette with the object of aiding in their cure, only too often results in the process becoming general with the most disastrous consequences. Many cases might be detailed in which the use of the probe or curette, under these circumstances, has resulted in general purulent labyrinthitis, meningitis and death. If a fistula is suspected in an active labyrinth, a radical or mastoid operation may be performed but manipulation at the site of the osseous defect in the labyrinth capsule is very dangerous.

Then again, in a serous labyrinthitis no one would think of opening the labyrinth. It is unfortunate that at times the diagnosis between purulent and serous labyrinthitis becomes impossible. Nevertheless, anyone who operated upon a labyrinth the seat of a serous process would do so upon the supposition that the disease was purulent in nature and that even if this was not the case, since the diagnosis was impossible, it would be safer to drain the labyrinth.

As to the indications for operation in the manifest stage of purulent labyrinthitis surgeons seem to be divided into two groups. The one would open and drain every such labyrinth, while the other, regarding themselves as conservative, operate only when meningitis occurs or seems imminent. The former, no doubt, perform operations on a considerable number of patients who would recover without interference, while the latter allow many patients to die who would have had a very good chance to live had they been operated on earlier. The following is a brief report of three cases in which the latter plan was adopted. They were under the writer's

*Read before the American Otological Society, Washington, D. C., May 10, 1916.

care, in Dr. Dench's service at St. Luke's Hospital and at the New York Eye and Ear Infirmary.

Case 1. J. S., male, 28 years old, had chronic suppuration in the right ear for which a radical operation with primary graft was performed on December 22, 1914. He apparently made a good recovery, leaving the hospital at the end of two weeks. The graft took throughout the major part of the cavity, but granulations formed in the region of the fenestrae. One week later, that is, three weeks after operation, the patient complained of vertigo, nausea and had nystagmus to the opposite side. Tests made at this time apparently showed presence of irritability of the labyrinth. Three days later he complained of pain in the side of the neck, which later became very severe and radiated to the head. The patient was admitted to the hospital and lumbar puncture performed. The spinal fluid contained 276 leucocytes per cubic millimeter; lymphocytes, 89 per cent; polymorphonuclears, 11 per cent. Globulins present. Culture of this fluid for 36 hours gave a few colonies of gram positive cocci in chains and pairs. Examination, made three hours after the lumbar puncture, showed the hearing in right ear to be zero, with absence of caloric reaction. Rotation to right, nystagmus to left fifteen seconds; rotation to left, nystagmus to right seven seconds. Labyrinth removed after the Neumann method. Cerebro-spinal fluid drained from the internal auditory meatus for 36 hours, but the operation seemed to have but slight, if any, beneficial effect upon the meningitis, and the patient died on January 28, five weeks after the radical operation, the meningitis having lasted one week. Spinal fluid on the day of death contained 9,000 leucocytes, with a 93 per cent of polymorphonuclears. Butyric acid test positive.

Case 2. M. B., male, 11 years old. Chronic suppuration in the right ear for eight years. There was a polypus and granulations in the tympanum with a posterior defect in the membrana tympani. Radical operation on July 19, 1915, by Dr. Bowers. Primary graft did not take and convalescence was complicated by a rise of temperature at end of the first week, due to infection of the radical cavity which cleared up by irrigations with a solution of iodine. Discharged August 2, in good condition. Readmitted August 11. The patient had vertigo and vomiting for two or three days, accompanied during the last day or so with headache and fever. There was a well-marked nystagmus to the left, that is, to the unoperated side. Hearing on the right ear zero. No reaction with hot or cold water irrigation. Turning to the right, nystagmus to the left in-

creased for about fifteen seconds. Turning to the left no nystagmus to the right. Spinal fluid leucocytes 720 per cubic millimeter; polymorphonuclears, 73 per cent. Globulins positive. Culture negative. Labyrinth operation with free exposure of dura in the middle and posterior fossa performed on the day of admission. Abscess containing caseous material found upon incising the dura in the internal auditory meatus, culture from which was negative. August 14, spinal fluid leucocytes 1,700 polymorphonuclears, 98 per cent. Globulins, double plus. Slight reduction of copper by Fehling's test. Culture negative. This fluid injected into a guinea pig produced no apparent results. The fluid from several other spinal punctures was negative upon culture. Exploration of the temporo-sphenoidal lobe and cerebellum gave negative results. Patient died on August 16, four weeks after the radical operation, one week after the onset of meningitis.

Case 3. H. C., male, 20 years old, had a simple mastoid operation performed on the right side on June 21, 1915. The wound healed but the discharge continued free and possessed an odor, notwithstanding irrigations and other local treatment. Six months later, in December, otoscopic examination showed the drum membrane absent, the internal tympanic wall dermatized except in the region of the oval and round windows where granulations were present. A sinus discharging pus extended up beneath the posterior fold.

A radical operation with primary graft was performed at three o'clock on the afternoon of December 12, 1915. No dura or sinus exposure. About twenty-four hours later the patient became dizzy and developed nystagmus toward the side of the unoperated ear. Temperature, 101.5; no headache.

Twenty hours later, that is, forty-four hours after the operation, the patient seemed better, vertigo less, in fact, nearly absent; the nystagmus remained unimproved, temperature 100.5. As the patient had had a very slight headache, a lumbar puncture was made and a fluid obtained under some pressure, which contained 145 leucocytes to the cubic millimeter with a polymorphonuclear percentage of 70. Globulins present. Reduction of copper by Fehling's test. Culture of this fluid was negative. The patient was totally deaf in the right ear and irrigation with hot or cold water was without effect upon the eyes. A labyrinth operation was performed at once, that is, about forty-eight hours after the radical. Free flow of cerebrospinal fluid from the internal auditory meatus. The sinus was accidentally wounded by the assistant while sponging, probably by a chip of bone. In addition to removing the promitory, the modi-

olus was taken away with the curette. There was no facial paralysis.

The flow of cerebro-spinal fluid continued for six days, being quite copious at first. During this time it was impossible to obtain more than a few drops of fluid by spinal puncture, so that no leucocyte count was possible; but culture was negative. The temperature varied between 102° and 99° during the first week, then continued practically normal. There was headache, stiffness of the neck and a positive Kernig. The nystagmus diminished slowly; but there was no vertigo complained of except during the first twenty-four hours after the onset of the labyrinthitis.

Lumbar puncture on the sixth day after the labyrinth operation gave fluid with a cell count of 26 and a trace of globulins probably due to admixture with blood. Culture and complement fixation test of this fluid were both negative.

On April 9, more than three and one-half months after the operation, rotation to the right produced nystagmus to the left seventeen seconds, rotation to the left showed nystagmus to the right seven seconds in other words, compensation in the sense in which the word is used below had not become established.

The tympanum dermatized over and the posterior wound filled with granulations, then became covered with epithelium without the production of a permanent posterior opening; healing being complete in about four months and the patient in a fine physical condition.

As to the nature of the meningeal process in this patient it seems very probable that it was an early stage of a purulent inflammation which was cut short by the prompt performance of the labyrinth operation. Still, as the patient recovered and no bacteria were demonstrated in the spinal fluid by culture, the possibility of its being of a serous nature must be conceded. Case 2 above reported died and cultures of the fluid obtained at four separate lumbar punctures were negative. Was it therefore of a serous nature? It was suggested by the pathologist that perhaps the fluid contained an anaerobic germ. As no more fluid was available, the patient having died, this matter could not be investigated.

Yansen (cited by Ruttin, "Diseases of the Labyrinth") reports a case of serous meningitis cured by a labyrinth operation.

It seems as though this case would teach us that the spinal fluid gives evidence of meningitis before there are any clinical manifestations of the disease. This being so, if one determines to treat a patient who has the manifest form of a purulent labyrinthitis ex-

pectantly, lumbar puncture made at regular and frequent intervals will afford the surgeon the earliest possible evidence of the onset of meningeal inflammation and enable him to remove the labyrinth with a prospect of success, when, if he waits for fever or headache, the process will then be in too advanced a stage to expect much from a labyrinth operation.

It is the writer's belief, however, that every labyrinth the seat of a diffuse suppurative inflammation should be drained by opening the vestibule and removing the promintory, and this at the earliest moment after the diagnosis has been established. This operation naturally is not sufficiently extensive when evidence, clinical or cytological, is present that the meninges are involved. In this case the Neumann operation or some modification of it which drains the subdural space at the internal auditory meatus and exposes and incises, if necessary, the dura in the middle and posterior fossae should be performed.

As to the latent form of diffuse suppurative labyrinthitis there are three types of cases:

1. Those in which the middle-ear process is healed and requires no treatment. These patients are usually doing very well and as there is no hope of regaining any function with or without operation there seems no reason to interfere as the danger of meningeal inflammation is, as a rule, passed.
2. In the second class the latent purulent labyrinthitis is associated with a purulent otitis media. When this is the case, operative interference with the object of relieving the middle-ear process becomes a graver procedure on account of the traumatism having a tendency to break down the barriers which nature has interposed between the suppurative process in the labyrinth and the meninges. It is, therefore, safer to open and drain the labyrinth at the time the radical operation is performed. The writer believes this drainage is sufficient; but some surgeons claim that the danger of intracranial infection is still further minimized by removing the posterior surface of the petrous pyramid to the internal auditory meatus, then opening and draining the subdural space in this location.

In one type of case an exception may be made to this rule. If the disease in the labyrinth is a healed process, danger of infection of the meninges may be regarded as practically absent. This occurs when the labyrinth spaces become filled with fibrous tissue and new bone. Rutin has shown with a fair degree of certainty that this has taken place in patients who show "compensation" on the rotation

test. Thus with one labyrinth destroyed, as shown by total deafness and negative caloric reaction, if upon rotation with the head erect the after nystagmus in either direction is about equal and in the neighborhood of ten or twelve seconds, "compensation" has taken place and it may be assumed that the condition in the labyrinth is an healed process. In this event, one would, until further evidence is forthcoming, be justified in performing a radical operation without at the same time interfering with the labyrinth.

3. The third class comprises those cases in which there is necrosis of the labyrinthine capsule. When this occurs, either in the form of a fistula leading into a dead labyrinth or with the presence of a sequestrum, it is one's plain duty to remove the dead bone and afford adequate drainage.

237 West Seventy-fourth Street.

Bile and Bile Salts in the Treatment of Ozena. CIRO CALDERA,
Arch. ital. di Otol., Rhinol. e Laringol., Feb., 1916.

The author carried out a series of experiments *in vitro* consisting of the addition, to one set of bouillon cultures of the Perez bacillus made by placing crusts from ozena patients into the bouillon, of from one-fourth to one cubic centimeter of pure bovine bile, and to another set of a 3 per cent solution of sodium taurocolate. The cultures were then placed in the thermostat for 48 hours. As compared with controls, to which neither bile nor sodium taurocolate had been added, it was found that the feter was very considerably reduced and this diminution was in direct ratio to the amount of bile or bile salt added. Acting upon these findings, Dr. Caldera employed the bile and bile salts clinically, a strip of gauze immersed in sterile bile or 3 per cent sodium taurocolate being inserted into the nasal cavity of the patients under treatment and allowed to remain therein at first from ten to fifteen minutes and for longer periods at subsequent treatments. He claims to have obtained complete absence of feter after the first two or three applications. He suggests that even better results are to be obtained by employing this method in conjunction with the submucous injection of paraffin.

P. F.

**THE VALUE OF THE ROENTGEN RAYS IN THE DIAGNOSIS
OF DISEASES OF THE ACCESSORY SINUSES, WITH
NEW TECHNIQUE FOR THE SPHENOID.***

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The value of the Roentgen rays in the diagnosis of diseases of the accessory sinuses has been steadily increasing since the earliest, but unsatisfactory attempts at Roentgen diagnosis in 1897 by Scheier,¹ and in America by Philip.² This value has been increasing according to the skill that has been developed in the technique of making accurate Roentgenograms, and also in accordance with the skill in interpretation of these Roentgenograms. We are especially indebted, in America, to the early work done by Coakley and Caldwell,³ and to the early work done in Europe by Macintyre,⁴ Regnier and Glover,⁵ Winckler,⁶ and especially by Killian⁷ in 1903. Since then the literature has become so extensive that time will not permit even the mention of the names and the work done. Berry,⁸ a year ago gave a very excellent review of the development of the technique and made a plea for uniformity. However, he recognized, as we all do, that the technique must be somewhat modified according to the shape of the head. My own work in the study of the accessory sinuses was started in 1902.

The use of the Roentgen rays has now become so thoroughly established, that it is almost a routine method employed in the study of diseases of these sinuses. There are, however, a number of elementary facts that are not sufficiently appreciated, by the rhinologists, or even the Roentgenologists. Then too, the relative value of the various methods of making these Roentgen examinations is, I believe, not sufficiently appreciated, and our skill in interpretation can never be perfect. Therefore, a discussion of this subject from time to time, I believe, will be of value to all.

First. One of the elementary facts that all must learn sooner or later in order to determine the actual value of the rays, is that the Roentgen rays only record the differential density, modified by the thickness of the tissue, on the photographic plate, or the relative amount of absorption of the Roentgen rays by any tissue. Therefore, if the accessory sinuses are relatively small, they will contain less air, and they will be relatively more dense because the con-

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trast between the air and the bony tissue round about is not so great. As an example: A small frontal sinus on one side, when compared with a large frontal sinus on the other side, will be relatively more dense, and may lead to the suspicion or diagnosis of impaction unless one is cautious.

Second. The amount of contrast between the accessory sinuses and various air-containing cells will depend, in great part, upon the



Fig. 1. Longitudinal section of a skull containing all of the soft tissues. Sphenoid sinus filled with bismuth. The bottom of the illustration corresponds approximately to the position of the film in the mouth. The white lines show the lines of projection of the sphenoid sinuses upon the film. One can also see how posterior ethmoid cells will also be projected upon this film.

health of the surrounding bone. For instance, the most contrasty and clear negatives will be obtained in healthy, young adults because the bones are healthy, smooth, contain a normal amount of lime salts, and each line is clear cut and sharp. By contrast with this healthy appearance, in a case of acute general infection of the sinuses, the bones seem to have lost part of their lime salts, and that helps to

make a less contrasting picture, and more difficult for diagnosis. In all chronic cases of inflammation of the accessory sinuses and infection, the outlines of the cells (particularly the ethmoid cells), are very generally blurred, because the bony tissues have become thickened and uneven.

Third. It must be borne in mind that other conditions will cause a blurring of one or both sides of the sinuses when a comparison is made, such as thickening of the mucous membrane from old inflammation, swollen tissues outside the face, such as a swollen cheek, or tumor formation on the face outside of the accessory sinuses.

Fourth. In the interpretation of negatives in general, one must keep in mind also the bone or the tissues back of the accessory sinuses which produce shadows that are thrown down upon the plate, such as the vertebra, base of the skull, the orbit, the petrous portion of the temporal bone, etc.

In general, one should not attempt to interpret these negatives for disease of the accessory sinuses unless they show good detail of the structures which one knows to be healthy. It is rare that the bones of the entire skull are diseased, and if the negative is good, sharp detail will be shown somewhere, and based upon this elementary study, one can determine the relative value of the density cast by the other tissues in the neighborhood of the accessory sinuses.

We all know very well that the rhinologists can determine by transillumination the relative density of the two sides of the accessory sinuses, especially the maxillary sinuses, but in these days of refinement in diagnosis and therapy, one wishes to know a great deal more than the mere relative density of the two sides. We should know the size and shape of the two accessory sinuses, the position of the septa, the involvement of the surrounding bone tissue when diseased, such as occurs with tumors, the cause of the sinus involvement, such as disease of the maxillary sinus secondary to infection from the teeth, the thickness and density of the bony tissue surrounding, etc., all of which will influence the diagnosis and the treatment, and these facts can undoubtedly be obtained much more satisfactorily by accurately prepared Roentgenograms than by any other means. Then too, when there are a number of sinuses involved, it would seem more difficult to determine this fact by transillumination.

Fluoroscopic examinations in the diagnosis of diseases of the accessory sinuses, I believe, have no place whatever.

Technique. In general, a laboratory report that is inaccurate or incomplete, is very often worse than useless, and may often lead the rhinologist astray. The accuracy of a report, often depends upon the amount of work that is done. I find that very often Roentgenologists are requested to limit their expense, and thereby render their report less accurate, and occasionally distinctly inaccurate. I have always thought that the value of a Roentgen-



Fig. 2. Shows the position of the patient and the apparatus with the film in the mouth during the exposure.

ologist's time is of more importance than the materials used. Therefore, since the greater bulk of time is consumed in getting the patient ready and in making the report afterward, the time used in collecting definite material data should not be sacrificed for the sake of a moderate additional expense. Therefore, I make it a rule to make my examinations complete so that I can report upon all of the accessory sinuses. Some cases require more work than others,

depending upon the nature of the case, but I believe that one should never sacrifice the collection of data on the basis of expense, either in hospital practice or in private practice. Not infrequently I have found the sinuses diseased that were not suspected, and those that were suspected showing no evidence of disease. In general, I make use of from four to six exposures and more when I am searching for the cause, such as may occur in the teeth.

Waters has described a very ingenious method of making the examinations on a single 8x10 plate. Briefly described, this consists of the use of an 8x10 plate on an intensifying screen. Then placing the patient's chin upon the plate, and resting it at an angle which will bring the tip of the nose approximately one-half inch from the surface of the screen, which must be varied slightly according to the shape of the patient's head, and then resting the cylinder over the vertex of the skull in such a manner that the frontal sinuses are thrown down upon the plate free from any other overlapping shadows. The maxillary sinuses are also thrown upon the plate without the overlying shadow of the petrous portion of the temporal bone. This method brings out the maxillary and the frontal sinuses very clearly, the ethmoid cells less clearly, and the knowledge obtained of the sphenoid sinuses is almost nil. The exposure is made on this intensifying screened plate about fifteen seconds, with about fifteen milliamperes, making use of a very soft ray that will equal a parallel spark of approximately two inches. I would be fearful of the loss of hair under these conditions, especially if an exposure would have to be repeated, though it is the routine method at the Johns Hopkins Hospital, and there seems to be no justification for my fear. The great amount of negatives which they have are really beautiful, and in general, are most convincing of its value, though I think one sacrifices fine detail when compared with the more tedious method which I use.

The position of the patient is a very important factor, but of greatest importance is the absolute stillness of the head during the exposure. I believe that most men make their examinations with the patient in a recumbent posture, but Percy Brown has devised a very ingenious chair which permits the patient to sit up during the exposure. This has a great advantage of making the patient more comfortable, being less embarrassing, and perhaps in obtaining the level of free fluid in the accessory sinuses. It is very cleverly designed, and I believe of distinct value, but it adds another piece of apparatus to the Roentgenologist's already very much overcrowded laboratory, and I believe that it is not essential. In general, I be-



Figs. 3 and 4. Show two normal sphenoid sinuses projected on the film in the mouth. The large white areas at the top of the picture indicate the sphenoid sinuses. It will be noted that none of them are symmetrical. The light areas in front of these sphenoid sinuses indicate the ethmoid cells.

lieve that the patients can be kept still in the recumbent posture better than in any other position. This is certainly true in the general examinations which one makes, for a slight movement of the whole body would move the part under examination, and we probably all know that it is practically impossible for anyone to stand absolutely still. It is most difficult to sit absolutely still, and since our exposures run over a period of a number of seconds, it is required that one devise some scheme for absolute quietness.

My routine for the examination of the accessory sinuses is as follows: The patient is allowed to lie prone, the hands and forearms are folded under the upper portion of the chest. The forehead is placed firmly upon the plate. The patient's head is then held in position by a bandage firmly attached to each side of the table, or by means of sand bags laid against the side or top of the head. The first exposure is then made with especial reference to the frontal sinuses, and the central rays are passed through the skull from about two inches above the occiput, and directed toward the frontal sinuses. This will vary somewhat with the shape of the patient's head. I make use of a small diaphragm and cylinder, three inches in diameter, which will include only the frontal region. This gives one sharper detail, and detail is the most important part of these examinations.

The length of the exposure will depend upon the equipment. The second plate is made with special reference to the sphenoid sinuses, and for this I pass the rays through a plane which passes through the external auditory meatus, and the outer canthus of the eye. This position was described by me before the American Laryngological, Rhinological and Otological Association, May, 1912, and I laid considerable stress upon it, but it seems to have escaped attention in favor of the oblique position which I described at the same time, and which I consider of distinctly less value. I described the oblique position as an accessory method. Thereby one can also confirm a diagnosis or clear up one that is otherwise obscure. The oblique position, which I only use occasionally, consists in placing the patient's head so that the brim of the orbit is resting upon the plate. This will make the weight of the head rest upon the superciliary ridge, the nose and malar bone. The tube is placed at a distance of 22 inches from the plate, in such a position that the central rays will enter the opposite parietal region about two inches posteriorly, one and one-half inches above the external auditory meatus, and project toward the center of the orbit. If this plate is properly made, the optic foramen will occupy the center of

the orbit, and at the outer side will be found the sphenoid tissue. Then toward the median line will be projected the sphenoid sinuses, anterior to the optic foramen. Above this will be seen the upper brim of the orbit, and above the orbit the frontal sinuses. If the proper position has been used, and a good plate obtained in the central position, previously described, the reading of the negative from above downward will be as follows:

1. Frontal bone and brain tissue.
2. Frontal sinuses not well shown.
3. Cribriform plate with a few small ethmoid cells below.



Fig. 5. Shows the maxillary sinuses with the teeth surrounding them.

4. On each side of the median line (in a normal skull), a triangular transparent area with rounded corners, the base of the triangle being in the median line or septum. These areas are approximately one-half to three-fourths of an inch in diameter. If they are diseased, they will be opaque in proportion to the amount of exudate or tumor tissue contained. They may be irregular, deformed or absent. Their walls may be broken down by disease (such as syphilis), or they may be excessively dense as from osteoma.

5. On either side of the sphenoid cells one will see the projected shadows of the posterior ethmoid cells, and below them the anterior ethmoid cells.

6. Below this area are the nasal cavities with the middle turbinate above and the inferior turbinate below.

7. On either side of the nasal cavities are the large, triangular, transparent areas of the maxillary sinuses.

8. Projected into these sinuses one sees the shadow of the atlas bone.

The fourth plate in routine is made with the patient in the same position, and the rays are passed below the line of the mastoid, directed toward the maxillary sinuses. This will show the maxillary sinuses on each side, the nasal cavities with the turbinate bone, and by this position one can determine to a great extent the size of the turbinate bone, the position of the septum, etc. Overlying these maxillary sinuses, under these conditions, is the body of the petrous portion of the temporal bone. One then looks for opacity of one or both sinuses, or disease of the walls.

The lateral view. This is important for the study of both the sphenoid, the ethmoid and the frontal sinuses, and for tumor formation in the antrum, one often gets distinct knowledge as to the extent backwards of the growth. At times it is desirable to make stereoscopic plates including the entire head in order to study the lateral view. This will often give one very satisfactory information which will be of value in the treatment of the patient. Stereoscopic plates may be made of smaller size so as to include only the sphenoids, ethmoids and the frontal sinuses, and this is generally my plan. Or the lateral view may be studied very practically by means of two plates made of one or two sides in such a manner that the proximal sphenoid sinus to the tube is projected downward slightly below the sinus on the side near the plate. This is a suggestion made by Dr. Ashbury, and I find it very practical. It is especially practical because the rhinologists can appreciate it better than the stereoscopic pair, unless they have at hand a stereoscope.

For the study of the sphenoid sinus laterally, an imaginary line is drawn between the external auditory meatus and the external canthus, and at a point midway between these two, and one-eighth of an inch below it, the central ray is passed. This will give very clearly the vertical dimension of the sphenoid sinus and the longitudinal dimension. By none of these methods do we obtain exactly the lateral dimension, and when this is important it is necessary that we study the case by one of the vertical positions.

New technique for the sphenoid. A number of years ago I tried to make studies of the sphenoid sinus by means of a vertical view by passing a film inside the mouth and pressing it against the vault of the pharynx, and projecting the sphenoid sinus directly down upon it. At that time this method was not a success. I failed, I think, chiefly because of the secondary radiation from the mouth, and also because I probably did not get exactly the right angle for my rays. Since then, however, I have overcome these difficulties as follows: I make use of X-ray films cut to the size of two by three and one-quarter inches with two of the corners rounded. Black envelopes are made to exactly fit these films. They are then wrapped in wax paper and placed in the mouth, forcing the film back against the posterior wall of the pharynx as far as possible. The patient then bites the teeth down against the film, which holds it firmly. The patient is previously gotten in the correct position by placing him or her in a sitting posture with the chin resting upon an adjustable holder at such an angle that the rays can be projected toward the film from a point in the median line, midway between the glabella and the occiput. (Figure 1.) For this purpose I use a compression cylinder, two and three-fourths inches in diameter and six and one-half inches in length, which is brought down firmly against the top of the head. (Figure 2.) An exposure is then made of approximately 150 milliamperere seconds with a current whose voltage is equal to a seven inch spark gap. With some patients it may be necessary to cocaine the pharynx in order to prevent gagging. So far, I have not found this necessary. With a film made under these conditions, the outline of both sphenoid sinuses is shown very accurately, and with a wonderful amount of detail. (Figures 3 and 4.) Based upon my own experience, it is the most satisfactory position that has yet been described for the vertical view of the sphenoid sinus, both as to results and to the comfort of the patient during the examination. I believe this method is practical for routine use. The negative shows a border of teeth, and within the area outlined by the teeth there is nothing shown but the sphenoid sinuses lying side by side posteriorly, and in front are shown a group of ethmoid cells.

Another vertical position has been described by Pfeifer,⁹ and used by Dr. Law of New York, and this is the one I most commonly had been using. It consists in sitting the patient at the end of a table, or placing the patient in a prone position, and with the chin propped up on books or a block, so as to bring the vertical diameter of the skull almost at right angles with the under surface of the

chin, and then passing the rays down through the top of the skull in such a manner that the sphenoid sinus is projected just back to the maxillary symphysis. Recently, I make these with the patient sitting in the position described or my film technique.

The application of these films in obtaining a vertical view of the maxillary sinuses and the anterior teeth. (Figure 5.) It is sometimes desirable to obtain a vertical view of the maxillary sinuses, especially to study the relation of teeth. These films which I have developed for use in the study of the sphenoidal sinuses may be used also in the study of the maxillary sinuses. They are held in the mouth in the same way, and the central ray is passed through the tip of the nose as nearly as possible perpendicularly to the films. This makes a beautiful record of the teeth and the floor of the antrum.

The Diseases of the Accessory Sinuses.

Impaction with exudate. In the great majority of instances, the Roentgen rays are used in the study of the accessory sinuses to determine the presence or absence of impaction by exudate. This exudate is usually composed of pus, or pus and mucous, but may, of course, be composed of blood. The nature of the exudate in general cannot be determined Roentgenographically, but must be inferred from the associated symptoms and history and other evidences. In general, all the exudate has approximately the density of water, and one is able to recognize the impaction by this exudate because of the increased density of the tissues produced by this exudate, as compared with the opposite side. One can usually recognize this impaction very easily when only one of the duplicate sinuses is involved. For instance, if only one maxillary sinus is involved, the contact between the healthy side is quite strong, and one can easily recognize it. This is less clearly shown when both of the maxillary sinuses are involved, but in such instances one determines the clearness and readability of the negative by studying the other sinuses. For instance, if the frontal sinuses are clearly shown, or the sphenoid sinuses are clearly shown, and the maxillary sinuses on both sides are opaque, one can then make the diagnosis of bilateral disease of the maxillary sinuses. The same is true of the ethmoid cells. If only one group of the ethmoid cells is involved, the clearness by contrast as shown in the opposite sinus makes the diagnosis easy. Often both ethmoid groups of cells are diseased, and in such instances the interpretation is more difficult. In the postero anterior position, for instance, one has, as a complication in the reading of the negative, the shadows cast by the sphenoid sinuses. When they

are clear, one can recognize the outline, however, of the sphenoid sinuses even though the ethmoid cells are impacted with pus, and one can recognize the impaction of the ethmoid cells beyond the area or outline of the sphenoid sinuses. If the sphenoid sinus is totally impacted on one or both sides, and the ethmoid cells are clear, one can then recognize the clear ethmoid cells lying outside of the wall of the sphenoid sinus. Generally speaking, however, when both sphenoid sinuses are impacted, or even when one sphenoid sinus is impacted, the ethmoid cells are very apt to be involved on the same side or on both sides when both sphenoids are involved.

In the study of the frontal sinuses, one must always keep in mind the possibility of a variation in the size and the depth particularly of the frontal sinuses, and if the frontal sinus on the one side is very shallow, it will be distinctly more opaque than the opposite side which may be deep. Occasionally one finds this condition. A confirmatory plate, however, made in the lateral view, will assist materially in clearing up this point.

When one finds the maxillary sinuses impacted with pus, it is often very desirable to study the teeth on the affected side by the usual method used for the Roentgeneographic study of the teeth, to determine whether the cause of the pus in the antrum may not be due to an infected root of the teeth.

Tumors of the accessory sinuses. In my experience the great majority of tumors affecting the accessory sinuses involve the maxillary sinuses. When the maxillary sinus is involved by tumor one obtains not only the very marked increased density, but generally the outline of the sinus is disturbed. The walls are partially or completely absorbed, and there may be associated considerable enlargement of the maxillary sinus or jaw. Then too, in the lateral view, one can usually recognize the extension backward of this tumor mass into the ethmoid cells. In an extensive tumor involving the maxillary sinus, one very commonly finds too, a bulging inward of the inner wall in the antrum, crowding the nasal space, sometimes clogging it, and even at times pushing the nasal septum toward the opposite side. Generally one finds a very striking contrast between the healthy side and the diseased side in tumor formation.

While this description applies more commonly to the maxillary sinus, it would also apply to the other sinuses when they are involved. The tumors affecting the sinuses may be carcinoma, sarcoma, osteoma, mucocoele, and angioma.

Conclusions. 1. By means of the Roentgen rays one may determine accurately the size, outline, form and general character of the acces-

sory sinuses. 2. One can determine the presence or absence of exudate in these sinuses. 3. One cannot determine accurately the character of such exudate. 4. Tumors of the accessory sinuses may be definitely diagnosed, and their extent of distribution determined.

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Sarcoma of the Inferior Maxilla. J. DAWSON WHITALL, *New York Medical Journal*, Vol. CIII, No. 2, Jan. 8, 1916.

The author reports a case of removal of the inferior maxilla in August, 1911, for small round-cell sarcoma, with no recurrence after four years have elapsed. The patient was also treated with x-ray and Coley's fluid.

PACKARD.

The Treatment of Suppurative Otitis Media. J. S. DUNN, *The American Journal of Clinical Medicine*, January, 1916.

In sub-acute and chronic suppurative otitis media, Dunn has been successful with the following solution:

Acetanilid	grs. 32
Resorcin	dr. 1
Boric acid	drs. 2, grs. 24
Formalin	m. 20
Alcohol	ozs. 2, drs. 3
Water, enough to make	ozs. 16

After thoroughly cleansing, a tampon, saturated with the above solution, is inserted well into the canal and changed at first daily and afterwards at longer intervals.

SCHEPPEGRELL.

REPORT OF THREE CASES OF SALIVARY CALCULI.

DR. W. H. HASKIN, New York City.

From the scarcity of cases reported it would appear that this condition is comparatively rare. In a report of four cases made by Dr. R. C. Myles, in 1904, before the American Laryngological, Rhinological and Otological Society, he stated that the Surgeon General's Catalogue up to that date contained only one hundred reports of such cases. The Index-Medicus of the LARYNGOSCOPE for the past four years adds seven others, and four more cases were spoken of in the discussion of the symposium on the Salivary Glands, at the 1911 meeting of the American Laryngological, Rhinological and Otological Society. Text-books practically ignore the disease. Bosworth, Kyle, Watson, Williams, Phillips, and St. Clair Thompson do not mention it, but Grunwald says that the probable cause of salivary calculi is chronic inflammation of the duct. Having seen three cases, two within one year, the writer has felt that perhaps it is, in reality, not so rare, but that cases have not been recognized. Several of the cases reported above had been diagnosed as tumors and the true condition was not discovered until an operation for the removal of the tumor was undertaken. One case of spontaneous expulsion has been reported by Dr. Waldman, and many cases have probably cured themselves in this manner.

Case 1. G. Z., male, 42 years old, was first seen by the writer on July 10, 1900, with the following history: Twelve days before he had an attack of sore throat which was followed by an enormous swelling of the tongue and of the glands on the left side of his neck. The tongue protruded from his mouth and made it almost impossible for him to swallow or speak. Seven days ago three incisions were made in the tongue, and on the following day four more were made as the swelling had not subsided. The last incisions had been followed by a profuse discharge of pus. When he came to me, his own physician having gone to Europe, the tongue was about normal in size and showed the lines of the incisions which were healing nicely. There was no pain in the tongue but he complained of a large, glandular swelling in the left sublingual triangle which increased in size after each meal, but gradually subsided before the next, although never disappearing. On close questioning it appeared that he had been troubled with this swelling for many

months, but not enough to see his doctor about it. On examination, two fistulous tracts were found in the floor of the mouth, both of which discharged pus on pressure and both tracts lead down to the mass which he felt in the neck which was very marked. At the bottom of these tracts the silver probe disclosed the presence of a calculus. He was treated until July 26, and then all pus having disappeared, the calculus was removed through the posterior fistulous tract, this being dilated with Hank's uterine dilators and then with a pair of forceps with long flat blades. As the calculus lay more than an inch below the floor of the mouth it was rather difficult to get the necessary dilatation, but the forceps finally grasped the mass and after much twisting and more stretching it was extracted. The subsequent history has been entirely satisfactory and the patient has never had any further trouble, although the duct now opens opposite the last molar. The calculus had formed in Wharton's duct but at its exit from the gland, and evidently did not extend into the lobes of the gland so that the removal was comparatively easy. The severe attack of glossitis was unusual and such an attack has not been mentioned in any of the reports that the writer has seen. The specimen presented has been broken since drying, but weighs nine grains and was quite cylindrical when removed.

Case 2. Miss G. B., 25 years old, appeared at my office on June 7, 1911, with a painful swelling under the right side of her tongue, which she had had for about three years. Three or four times each year this became inflamed and on three occasions the swelling had been incised. At other times the pain and swelling had subsided after two or three days, but never entirely disappeared. On examination a small hard mass was felt in the right Wharton duct about one-half an inch from the punctum and was removed by a simple incision made down upon it in the direction of the duct. As the probe introduced into the duct showed that this was the only calculus present, the patient was discharged with much relief. She has reported through a friend that all has remained well. The specimen, which resembles the root of a tooth, weighs two grains. Although small, it had caused a great deal of suffering.

Case 3. E. R., male, 34 years old, was seen on June 13, 1912, at my office, and said that for years he had had a swelling under the angle of the right jaw which increased at mealtimes and frequently became very painful. One year ago it was treated with electricity for several weeks, but did not improve and he was then advised to have it removed by operation, as it was probably malignant. A

tumor was plainly visible below the angle of the right jaw which was very hard and quite moveable. Palpation between the fingers placed both inside and outside the mouth showed that the tumor was very hard and rough and exploration with a needle disclosed that it was a calculus. He consented to an operation at once and with Dr. Dwyer's assistance the mass was removed through the mouth, but only after much work, as the calculus appeared to extend into the several lobules of the gland and to be held by firm bands of tissue. The wound healed without any complication, and one week later a small stone was removed from the duct near the punctum. The patient has remained well and the tumor has entirely disappeared. This calculus is the largest of the three and weighed 17 grains. For a description of this condition, the writer would refer all to the symposium read in 1911, or to the report of Dr. R. C. Myles, in 1904, both appearing in the Transactions of the American Laryngological, Rhinological and Otological Society. The writer would suggest that in any doubtful case of swelling in the region of the salivary glands, especially if intermittent, that an exploration with any needle will show the presence of a calculus very promptly.

40 East Forty-first Street.

Vincent's Infection of the Middle-ear and External Canal. JAMES

ADAM, *Jour. Laryngol., Rhinol. and Otol.*, February, 1916.

Infection of the ear with Vincent's organism ultimately produces a characteristic clinical picture in the ear: chronicity, fetor, blood-stained discharge, erosion of meatus and external canal, the erosion bleeding at the slightest touch and coated here and there with a thin, greyish membrane which later is apt to be hidden by angry, bleeding granulations crowding the canal. The patient is usually a child in fair health. The author has seen chronic aural discharge in three children in one family, two of them with Vincent's organisms. The disease seems to be engrafted on a prior infection. Other organisms are always found, chiefly streptococci; after these come staphylococci and coliform or diphtheroid bacilli.

P. F.

THE ACCESSORY SINUSES OF THE NOSE IN THEIR RELATION TO THE CRANIAL NERVES.

DR. LOUIS G. KAEMPFER, New York City.

Unless the signs are unequivocal it is not difficult for one whose experience in these conditions is limited to overlook an infected accessory sinus. The diagnosis is often laid to one of the more striking complications while the true cause of the patient's trouble is not discovered. This is especially so in those cases in which there is involvement of one or more of the cranial nerves. The object of this paper will be to epitomize the relations between the nasal accessory sinuses and the cranial nerves in the hope that the danger of untreated and unoperated disease of the sinuses will be more apparent and send these patients to the rhinologist before important structures are permanently impaired or life is jeopardized.

Scattered throughout the literature are reports of autopsy findings in cases of fatal meningitis, in which pus, unsuspected during life, was found in the nasal accessory sinuses. As interest has developed in the field of rhinology and as the sinuses have become more accessible to the surgeon such reports have become less frequent.

Berger was the first to point out the relationship existing between the accessory sinuses and the optic nerve. Since then many investigators have taken up the subject and the literature is rich in instances of cranial nerve complications in sinus disease.

The nasal accessory sinuses are not fully developed until after puberty, therefore, although it occurs in children and is being more often recognized, accessory sinus disease is comparatively infrequent in the early years of life. It is possible that many of the long-standing cases whose time of origin the patients cannot remember began in childhood. In the main, however, it is a disease of adult life.

To review very briefly the topography of this region. There is an arbitrary division, generally accepted, into an anterior and a posterior group of cells. The anterior group consists of the frontal, maxillary and anterior ethmoidal cells; the posterior group consists of the posterior ethmoid and sphenoid cells. In a general way their names identify their places in the skull, but they are capable of such bizarre anomalies of situation that it is safe to say that no two individuals are alike and indeed the opposite sides of the same individual may be totally unlike.

The frontal sinus occupies, in the classical instance, the supra-orbital ridge and extends backward over the orbit only a very short distance. It is divided from the sinus of the other side by a thin, vertical plate of bone in the median line of the body. Sometimes the sinus may be so large as to fill out most of the frontal bone. Below it may extend, in the roof of the orbit, as far back as the sphenoid and laterally as far out as the zygoma. The sinus may be entirely absent or it may be absent on one side and present on the other. The writer has seen such a case in which the symptoms were referred to the side of the absent sinus. The wall between the sinuses may be considerably off the median line; so much so that a sinus situated on one side will belong to the other side and must be approached through the other nostril. There may be a dehiscence in the septum between the two sinuses and an infection in one sinus will quickly involve the other. The dehiscence may amount to an entire absence of the septum, making but one sinus.

The ethmoid cells are an anterior group opening into the infundibulum, and a posterior group opening into the superior meatus of the nose. They do not communicate with each other.

The anterior ethmoid cells are situated below and behind the frontal sinus. Their outer boundary is the inner wall of the orbit. In some instances the most anterior cell of this group is enormously developed and extends in an upward and outward direction into the frontal bone. In this case the frontal sinus is very small or absent. Such a cell is known as a *bulia frontalis*.

The posterior ethmoid cells belong to the posterior group of nasal accessory sinuses. They are also bounded externally by the inner orbital wall. They are fewer in number and smaller than the anterior ethmoid cells and show variations in size, extent and situation with regard to the sphenoid cells. They may be large and extend backward at the expense of the sphenoid cells. When they are small their place is occupied by large sphenoid cells. The cells of one group may overlie those of the other group or they may be in a different horizontal plane.

The maxillary sinus occupies the cavity of the superior maxilla and opens into the infundibulum. It also varies in size and in the thickness of its walls. These, if thin, render its relation to the orbit and to the fifth nerve much more intimate, and the danger of involvement of these structures in infection of the maxillary sinus much more imminent than, when in a small sinus with thick walls, they are protected by a thick layer of bone. The most frequent divergence from the normal is absence of the floor of the sinus in the region of the alveolar process and the projection of the teeth

directly into the sinus, their roots being covered only by its lining mucous membrane. This occurs usually in the region of the second bicuspid and first molar teeth and is the etiological factor in the large group of cases of maxillary sinus disease of dental origin.

The sphenoid cells, the most important from the viewpoint of relationship with intracranial structures, occupy the body of the sphenoid bone. There are ordinarily two, divided in the median line by a thin, vertical partition which is subject to the same variations as those described for the septum between the two frontal sinuses. A large sphenoid sinus will sometimes extend for a greater or less distance into the greater wing or downward into the base of the pterygoid process or, as above described, forward into the ethmoid.

The sphenoid sinus is cubical in shape and has six walls. The posterior wall is fused in the adult with the occipital bone; the inferior wall forms the roof of the nasopharynx. The mesial or internal wall is the septum between the two cells and the anterior separates it from the ethmoid and the cavity of the nose. The natural orifice of the sinus is in the anterior wall.

The external wall is the groove for the cavernous sinus and the carotid canal. The superior wall contains the cella turcica and the grooves for the lodgment of the optic chiasm and the optic nerve. It is these walls which are of greatest interest in the study of the involvement of the cranial nerves in diseases of the sinuses.

Onodi has gathered a large series of cases in which he has shown the radiographic pictures and has covered almost all the possible variations in size, contour and situation of the sinuses of the nose. This unstable anatomical relationship affords the possibility for most unusual and apparently unrelated groups of symptoms, all caused by the same etiological factor.

In addition to the variations in the situation and arrangement of the cells, which determine the symptoms of the individual cases, there is another factor of still greater importance that determines largely whether or not the infection is to be confined to the sinus or is to spread to the neighboring structures. This factor is the thickness of the sinus wall. If the neighboring structures are separated from the infected cell by a thick wall of bone there is little likelihood of direct extension of the inflammatory process. On the other hand, a thin, bony wall offers less resistance to an infection of the same virulence. In this connection the enormous importance of dehiscences in the bony wall will be brought to mind.

The mucous membrane of the frontal sinus can be in direct contact with the dura over the frontal lobe. A dehiscence in the lamina papyracea of the ethmoid leaves its mucous membrane in direct con-

tact with the orbital periosteum and the cellular tissue of the orbit. The mucous membrane of the sphenoid may be in direct contact with the dura, or with the sheath of the optic nerve.

The Relations of the Cranial Nerves.—First Nerve: The olfactory bulb lies on the cribriform plate of the ethmoid and the nerves are distributed in three groups over the upper part of the septum, the roof of the nose and the superior and middle turbinates. Their function is practically always affected, either through the congestion of the mucous membrane in which they lie, or directly by extension of the infective process.

Second Nerve: The optic nerve is the most important cranial nerve that comes into relationship with the nasal accessory sinuses. The intimacy of this relationship depends upon the size and distribution of the sinuses and the thickness of the bone between them and the nerve.

The optic nerve, in its course from the chiasm, goes forward and outward and enters the orbit through the optic foramen, which is a canal formed by the roots of the lesser wing of the sphenoid. Usually it is separated from the sphenoid by a fairly thick layer of bone. This varies greatly in different individuals. Where the sinus is small there may be twenty millimeters or more of bone between it and the nerve. In other instances the bony wall may be as thin as paper. Sometimes there is a dehiscence in the wall of the canal and the mucous membrane of the sinus is in direct contact with the prolongation of dura that forms the outermost layer of the sheath of the nerve. Where the sinus is greatly developed and the dehiscence is large the nerve abuts into the cavity of the sinus, covered only by the sphenoidal mucous membrane. Depending upon the arrangement of the cells, the nerve may traverse either the sphenoid or the posterior ethmoid sinuses, or both.

The wall of the canal (optic foramen) can be formed from the wall of the sphenoid or when the posterior ethmoids are large, or extend far back, or overlie the sphenoid, of the wall of the ethmoid cells. At times, when the arrangement of the cells is very irregular, those of one side may extend so far across the median line as to be in relation with the optic nerve of the opposite side. Zuckerkandl illustrates specimens in which both frontal sinuses were in relation with one optic nerve and formed part of the wall of the canal.

Pathology: In suppuration of the accessory sinuses the nerve may be affected (a) by extension of the inflammatory process, (b) by pressure from an orbital cellulitis or an orbital phlegmon, (c) by changes in its circulation.

(a) The path of the infection may be either by direct continuity through the bony wall or through a dehiscence in it; or by way of the lymphatics that pass through the cribriform plate with the olfactory nerves; or by way of the veins.

There is an extensive communication between the veins draining the nose and the accessory sinuses and those of the dura and pia, through the pterygopalatine plexus, the junction of the anterior and posterior ethmoidal with the superior ophthalmic veins and through emissary veins into the frontal sinus. The veins of the orbit, of the nasal cavity and of the pterygoid plexus empty posteriorly into the cavernous sinus. Anteriorly they communicate with the veins of the face, through the plexus around the lachrymal sac, the angular and the superior orbital veins. The central vein of the retina empties either directly into the cavernous sinus or, through the sphenomaxillary fissure it passes into the pterygoid plexus.

When the infection passes directly through the bone there is first caries and necrosis of the bone with perforation of the wall between the sinus and the optic canal. When the path of the infection is by way of the circulation there is first hyperemia, edema of the tissues surrounding the nerve sheath, hemorrhage, emboli and thrombophlebitis. In any instance the process may progress to a basal meningitis with thrombosis of the ophthalmic veins or cavernous sinus; or extra-or intra-dural abscess.

(b) When an orbital inflammation is present, either an abscess, a cellulitis or a phlegmon, there is pressure on the nerve caused by an increase in the orbital contents. This pressure results in congestion and edema of the nerve sheath with destruction of the tissues of the nerve. When there is edema of the retrobulbar tissues exophthalmos results.

(c) There may be atrophic changes in the nerve due to pressure on its nutrient vessels or as the result of thrombophlebitis of the ophthalmic veins.

Direct involvement of the optic nerve usually occurs in disease of the posterior ethmoid or sphenoid sinuses. In disease of the other sinuses there is more often an orbital inflammation with secondary involvement of the optic nerve.

Symptoms: In the severe cases the picture is that of an acute fulminating retrobulbar neuritis with rapid onset, severe pain and rapid and complete loss of vision. In these cases prompt operative interference alone can save the life of the patient. Many of the severe cases die, however, of basal meningitis or cavernous sinus thrombosis. In those that recover after oper-

ation there is usually quite rapid return of vision. In some cases there is some impairment of vision.

In the less severe cases there is amblyopia, central scotoma, color scotoma and contraction in the visual and color fields. Birch-Hirschfeld says that the enlargement of the blind spot is an early and an important symptom. According to Zentmayer the central scotoma occurs before there is any diminution of vision.

Contraction of the color fields is not confined to those cases in which there is extension of the inflammation beyond the sinuses. Routine examination of patients suffering from ethmoid and sphenoid disease will show contraction of the red and green fields in almost every case.

After the removal of the cause by intranasal operation the symptoms practically always disappear in their entirety. In rare instances optic atrophy may occur early and then there is no improvement in vision even after the removal of the offending cause.

Eye changes not only accompany sphenoid and ethmoid disease but can be found, though with less frequency in disease of the frontal and of the maxillary sinuses. Onodi reports bulbar and periorbital neuralgia, dacryocystitis and hyperemia of the disc with fullness of the retinal veins in frontal sinus disease; and orbital phlegmon with thrombophlebitis of the pterygoid and ophthalmic plexuses in maxillary sinus disease. Ziehm and Kuhnt report iritis after maxillary sinus infection.

The order of frequency in which there is involvement of the optic nerve with its concomittant symptoms is first in disease of the sphenoid sinus, less frequently in disease of the posterior ethmoids, then in disease of anterior ethmoids and of the maxillary sinus least frequently in disease of the frontal sinus.

The optic neuritides of nasal origin are usually unilateral. Bilateral optic neuritis can, of course, be caused by double sinus disease but that is of very unusual occurrence. Double optic neuritis is rather cerebral than orbital or nasal in its origin. Because of the peculiar anatomical relations sometimes pertaining the sinus disease and the optic nerve lesion may be contralateral. Even when there is caries or necrosis of the bone the optic nerve is not always involved. This is explained by the varied relationships, already referred to, between the optic nerve and the sinuses.

The Oculomotor Nerves: The third, fourth and sixth nerves can be considered together. Behind the orbit they lie in the cav-

ernous sinus, the third and fourth on its outer side, the sixth at about its center to the outer side of the carotid.

The outer wall of the sphenoid sinus is very thin and, as has already been shown, forms for a considerable part of its extent, the inner boundary of the sphenoidal fissure.

The same pathological processes as were discussed under the optic nerve pertain here. Inflammation in the contiguous sphenoid or posterior ethmoid cells will cause a collateral edema, perhaps a cellulitis by direct extension with pressure on the nerve trunks in the fissure or after they have entered the orbit.

Cases have been reported of temporary derangement of the ocular muscles in accessory sinus disease which disappeared when the sinus disease was cured. Hoffman reports paralysis of the third nerve, Fisch of the fourth and sixth nerves and Panas of the fifth and abducens nerves in sphenoid disease. In Rouge's case, in which there was purulent periostitis of the body of the sphenoid and pus in the sphenoid sinus, there was basal meningitis and blindness with divergent strabismus. Russel reports a case of sphenoid sinus suppuration with gradual loss of vision and ptosis of the upper lid. Lapersonne and Baumgarten both mention transitory and permanent pareses of the ocular muscles in sphenoid suppuration.

Fifth Nerve: The trigeminus is of interest in connection with the accessory sinuses in the light of the explanation of some of those persistent and severe facial neuralgias of unknown origin, which are apparently not amenable to any sort of treatment. It is possible, from this viewpoint, to obviate in many instances that last desperate resort in the attempt to relieve these sufferers—the Gasserian ganglion operation.

The sphenopalatine ganglion (Meckel's) is situated deep in the sphenopalatine fossa. Its sensory roots are derived from the superior maxillary branch of the fifth nerve and are usually two in number. Its motor root comes from the facial nerve. The latter arises from the geniculate ganglion of the seventh nerve in the aqueductus Fallopii, passes through the hiatus Fallopii on the anterior surface of the petrous bone and passing beneath the Gasserian ganglion enters the middle lacerated foramen. It is called the large superficial petrosal nerve.

The sympathetic root, the large deep petrosal nerve, is derived from the carotid plexus in the carotid canal and passing along the outer side of the internal carotid artery joins the motor root in the middle lacerated foramen.

The Vidian nerve formed by the junction of these two roots passes forward through the Vidian canal in the base of the pterygoid process of the sphenoid and entering the sphenomaxillary fossa passes into Meckel's ganglion.

The branches of distribution of the ganglion are to the orbit where they supply its periosteum; to the mouth where they are distributed to the hard and soft palate and to the tonsils; to the nose where they are distributed over its mucous membrane; and to the pharynx where they supply the mucous membrane of its upper part.

The sphenomaxillary fossa is a small triangular space bounded above by the body of the sphenoid bone and the orbital process of the palate bone, anteriorly by the superior maxilla and posteriorly by the pterygoid process and greater wing of the sphenoid. The floor of the sphenoid sinus is usually a very thin plate of bone and is all that separates the suppurating sinus from Meckel's ganglion. Sometimes a posterior ethmoid cell also enters into the formation of the upper boundary of the fossa. The maxillary sinus is in front of the fossa and is separated from it by bone of varying thickness. The ganglion, however, is not in contact with the maxilla, the sphenopalatine and the descending palatine arteries and their veins being in front of it and between it and the maxilla.

The process of the extension of an inflammation from the sinus to Meckel's ganglion is similar to that described above for extension to the optic nerve. Clinical evidence to support this view is found in cases reported by Roe and others and in the exhaustive investigations of Sluder. In a case that came under the writer's observation the first symptom was pain referred to the lower teeth. Some twenty-four hours later, when the writer first saw the case there was an acute maxillary sinusitis on the same side. There was then pain in the upper jaw. The pain continued during the course of the acute disease and was accompanied by herpes. The pain and herpes persisted until the natural orifice was enlarged surgically and good drainage established into the nose. A similar attack on the other side a few weeks later was also accompanied by pain in the lower teeth on that side but there was no herpes.

Sluder likens the sphenomaxillary fossa, in its relations to the nose, to an accessory sinus. He reports a large number of cases of a neuralgic syndrome—pain in the upper and lower jaws radiating around to the occiput and sometimes into the extreme-

ties. This pain is most severe at a point about five centimeters behind the tip of the mastoid and on a level with it. He has controlled the attacks by applications of cocain to the opening of the sphenopalatine foramen. In many cases there was sphenoid or ethmoid disease, a cure of which resulted in a permanent abeyance of the neuralgic attacks.

The prognosis in cases of cranial nerve involvement secondary to suppurative sinus disease is usually grave, especially in those cases that show involvement of the optic or motor-oculi nerves. This is so for the reason that once the wall of the sinus is passed and the orbit or the neighboring structures invaded, the possibility of meningitis with or without cavernous sinus thrombosis is always imminent. There is often some impairment of vision after involvement of the optic nerve but considering the gravity of the condition this can be discounted in the light of the conservation of the patient's life.

Where the fifth nerve is affected the prognosis, according to Sluder, is favorable. As soon as the offending sinus disease is removed the neuralgic attacks cease.

The treatment, after the process has passed outside the sinus is, in the case of orbital inflammation, wide external incision and an attempt to establish drainage through the nose from the affected sinuses.

Early operative interference in inflammatory sinus disease would, in most instances, prevent the process from getting outside the limiting bony walls of the sinus. As this fact has become more generally accepted it is only the most virulent and fulminating infections that get to this grave stage.

Conclusions: 1. Involvement of the nerve trunks and ganglia is possible by direct extension or by way of the blood and lymph streams.

2. The sinuses depart in their anatomical relations very frequently from the classical description and these variations may cause unusual and apparently unrelated groups of symptoms.

3. Symptoms of nerve involvement are always to be considered of deepest significance and may be the signs of profound involvement of important structures.

4. Early operative measures in disease of the accessory sinuses would prevent most of these cases from getting beyond the confines of the nose.

616 Madison Avenue.

A NEW METHOD OF OPENING THE DRUM MEMBRANE IN PURULENT OTITIS MEDIA BY MEANS OF A TREPHINE.*

DR. JOHN GUTTMAN, New York City.

A great majority of diseases of the ear begin with an acute affection of the middle-ear. Prompt and proper attention to this middle-ear trouble will result in a cure in a very short time; but if this be neglected it will lead to a functional disturbance, or will result in an intra-cranial complication, which may become dangerous to life. These facts make it imperative that we pay at least as much attention, if not more, to the acute affections of the middle-ear as we do to the rarer and less important diseases of the other parts of the ear.

While the etiology and pathology of most of the middle-ear affections, especially those of an inflammatory character are fairly well known, the therapeutic measures applied in these affections to-day are identical with those in vogue about fifty years ago. In acute catarrhal, or purulent inflammations of the middle-ear, we perform a myringotomy with a lancet-shaped needle or with a small knife with a somewhat broader blade, usually without anesthesia, and only in exceptional cases with local or general anesthesia. We thrust the point of a lancet needle into the lower anterior or posterior quadrant, or into the most prominent or bulging part of the drum membrane. The slit in the drum membrane is only as broad as the thickness of the piercing needle is. The length and direction of the incision varies. It is through this opening that the viscid or creamy, purulent secretion must pass. If the process is very acute, the force of the accumulated secretion widens somewhat the opening, and in the course of weeks, months, or years the secretion is discharged through this opening. This surely is not an ideal form of drainage. No surgeon would consider this form of evacuation of pus from a closed cavity satisfactory. The narrow slit in the drum membrane made by the very thin needle or knife will in some cases close in a few hours, either on account of agglutination of some blood or because some viscid secretion will fill in the small opening in the drum membrane.

To improve the drainage which is the main therapeutic measure in all acute or subacute cases of purulent or catarrhal inflammations

*Presented before the Section on Otology of the New York Academy of Medicine, January 14, 1916.

of the middle-ear, the following procedure is advocated: The ear canal is cleansed with peroxide of hydrogen and alcohol. In very sensitive patients and in children a general anesthetic may be administered; otherwise local anesthesia may be used. About three or five drops of a 4 per cent cocain solution is injected hypodermatically in the upper wall, at the junction of the membranous and bony parts of the ear canal. After waiting for about five minutes, the drum membrane is penetrated with a trephine of the following construction:

The trephine consists of a hollow steel barrel four inches long, the upper end of which is surrounded to the extent of one inch by a somewhat thicker furrowed steel mantel (as a handle) for the purpose of giving the operator a better grip in turning the instrument; and the lower (distal) end is finely sharpened, in the form of a circular knife, of one, one and one-half or two mm. diameter. This instrument is made by E. B. Meyrowitz, New York.

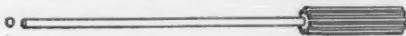


Fig. 1. Trephine for drum membrane.

This trephine is placed in the lower posterior quadrant no matter where the drum membrane may be bulging, because the drainage will always be better the lower the opening is in the drum membrane. If the drainage is good, the bulging part of the drum membrane will disappear spontaneously in three or four days. With one or two turns of the trephine a hole is pierced through the drum membrane. Immediately after the opening of the drum membrane in cases of otitis media catarrhalis acuta, a pulsating, viscid, colorless secretion will make its appearance through the wide opening, and the subjective relief of the patient becomes very marked. In many cases the patient will remark voluntarily: "Now my head feels much easier." In some cases the Eustachian tube may then be catheterized, in order to evacuate the pus from the tympanic cavity.

Up to the present time I employed trephining of the drum membrane in thirty-four cases, in most of them with excellent results. In the beginning when my technique was not as good as it is at the present time, the results of the operation were not quite satisfactory.

The following is a record of the cases:

Case 1. H. K., a machinist, 30 years old. Otitis media purulenta acuta paracentesis made by an otologist on February 1, 1914; treated for the purulent otitis media for three weeks; development

of mastoiditis and a mastoid operation advised by the attending ear surgeon. On February 25 the patient consulted me. Under local anesthesia I trephined the drum membrane; catheterization of Eustachian tube and suction by rarefaction in the external ear. Copious discharge. Great subjective improvement; white, croupous pseudo-membrane around the trephined aperture; ten days later discharge ceased. Small blood vessels in the direction of the scar in the drum membrane; five days later patient discharged cured.

Case 2. B. E., a married woman, 29 years old. Otitis media catarrhalis acuta. Bulging of Schrapnel's membrane. Local anesthesia. Trephined bulging part on March 3, 1914. After four weeks, mastoiditis developed. Mastoid operation performed. Wound completely healed eight weeks later. A few weeks after the patient had been discharged as cured, an otitis media catarrhalis acuta developed in the other ear. Trephining. This ear healed completely in two weeks.

Case 3. E. H., a boy 6 years old. Otitis media catarrhalis acuta. Local anesthesia; trephining of drum membrane. Usual treatment of the purulent otitis media resorted to. Lost sight of the boy after one week.

Case 4. B. K., a woman 25 years old. Otitis media catarrhalis acuta. Trephining of drum membrane under local anesthesia. Usual treatment of purulent discharge. Ear healed in three weeks.

Case 5. P. J., a boy 9 years old. Otitis media catarrhalis acuta. Trephining under local anesthesia. Copious discharge. Immediate improvement. Usual treatment of purulent discharge.

Case 6. G. W., a man 26 years old, was suffering from chronic purulent otitis media for many years. Tinnitus. Insufficient drainage. Trephining. Considerable improvement after one week's treatment.

Case 7. B. S., a boy 17 years old. Otitis media catarrhalis acuta. Local anesthesia. Trephining. The trephined piece of the drum membrane was not seen in the hole of the trephine. Through the opening of the drum membrane only some blood, but no pus was seen. On the second day, however, the trephined piece of drum membrane was seen to occlude the opening. By catheterization and suction a clear, syrup-like liquid was brought out. Considerable improvement followed this procedure. Ten days later the ear was perfectly dry, and the opening in the drum membrane was completely healed.

Case 8. R. W., a man 28 years old. Otitis media catarrhalis acuta. Local anesthesia. Trephining. Very little pain. Immediate improvement of subjective symptoms.

Case 9. B. K., a girl 22 years old. Otitis media catarrhalis acuta. Trephining. Healed in two weeks.

Case 10. K. A., a physician, 40 years old. Otitis media catarrhalis. Only a slight scar is visible on the drum membrane.

Case 11. C. T., a man 25 years old. Otitis media catarrhalis acuta. Upper wall of ear canal sagging; local anesthesia; trephining. Catheterization and suction. Ten days later the discharge ceased. acuta. Trephined. Immediate relief of subjective symptoms; five days later the ear was still discharging, but after this the patient failed to appear for further treatment.

Case 12. A. S., a man 34 years old. Otitis media catarrhalis subacuta. Tinnitus, drum membrane thin and atrophic. Trephining. No discharge, only some oozing of blood. There was very little improvement when patient was lost sight of.

Case 13. A. S., a man 34 years old. Otitis media catarrhalis acuta of both ears. General anesthesia with nitrous oxid gas, both drum membranes trephined. Purulent discharge. Both ears healed in ten days.

Case 14. W. S., a man 53 years old. Otitis media catarrhalis acuta. Local anesthesia, drum membrane trephined. Immediate relief. Healed in two weeks.

Case 15. G. R., a woman 54 years old. Otitis media catarrhalis subacuta. Local anesthesia. Trephining. Immediate relief after catheterization. Healed in two weeks.

Case 16. G. T., a man 34 years old. Otitis media catarrhalis chronica and tinnitus. Trephining. No discharge. Catheterization gave very little relief.

Case 17. Ch. E., a man 25 years old. Otitis media purulenta acuta. Three weeks ago paracentesis of the drum membrane was performed in one of the eye and ear hospitals in the city. The mastoid became involved and operation was advised. On examining the patient in my office I found only Schrapnel's membrane visible. This was bulging forward and several hunchback-shaped folds were superimposed one upon another. Through a very fine slit forceful expulsion of pus from the deeper parts was seen; drainage had evidently been insufficient. Under local anesthesia the trephine was pushed with considerable force between the folds, to the lowest part of the drum membrane. Through the opening a viscid, colorless fluid, evidently under great pressure, made its appearance. Catheterization was immediately followed by great relief. In a few days the folds were considerably diminished in size, and the patient felt much better; subsequent history unknown.

Case 18. W. M., a man 21 years old. Otitis media catarrhalis acuta following bathing; fifteen hours after onset of disease, trephining of drum membrane resorted to. There was no forceful expulsion of fluid through the wide opening, because in all probability the secretion in the middle-ear was scanty, as the process was very acute. After ten days the opening in the drum membrane was healed. Tinnitus. One month later tinnitus disappeared. Fine scar visible in the drum membrane. Hearing, which was impaired at the beginning, became normal.

Case 19. J. L., a girl 21 years old. Very severe otitis media catarrhalis acuta. Unable to sleep for the last two nights. Trephining, catheterization, immediate improvement. Subsequent history unknown.

Case 20. G. A., a man 37 years old. Otitis media purulenta acuta; ear discharging for the last four months. Drum membrane hardly visible, on account of the sagging of the upper wall of the ear canal. No discharge. Swelling and great sensitiveness over mastoid. Local anesthesia and trephining. No pain during the trephining. Forceful expulsion of colorless, pulsating, viscid fluid. Catheterization. Immediate slight improvement. The next day more marked improvement. Patient had a good night's rest, the first in three nights. This improvement continued, the sensitiveness of the mastoid was considerably diminished, but unfortunately on the fourth day after the trephining the pain returned and a mastoid operation had to be performed.

Case 21. R. H., a man 49 years old. Otitis media catarrhalis acuta following influenza. Drum membrane atrophied. Trephining; no discharge. but the next day there was secretion followed by marked subjective improvement.

Case 22. W. H., a man 19 years old. Otitis media purulenta acuta with mastoid complication. Trephining. Mastoiditis does not subside. Mastoid operation has to be performed.

Case 23. O. M., a man 26 years old. Otitis media catarrhalis acuta following douching of the nose. Trephining. No pain at operation. Only some blood oozing through opening. Immediate relief.

Case 24. K. S., a man 19 years old. Otitis media catarrhalis acuta. Trephined under local anesthesia. Further results unknown; patient lost sight of.

Case 25. A man 20 years old. Otitis media catarrhalis acuta. Trephining under local anesthesia. Patient failed to reappear for further treatment.

Case 26. G. J., a man 30 years old. Otitis media catarrhalis sub-*acuta*. Very small, nippleshaped perforation in Shrapnell's membrane. Trephined under local anesthesia. Free discharge. After one week, old opening almost closed. Two weeks later both openings closed. Three weeks after operation scar hardly visible. It can only be recognized by the small blood vessels running towards it.

Case 27. S. A., a girl 24 years old. Otitis media purulenta *acuta*. Paracentesis three days ago in Shrapnell's membrane. Insufficient drainage. Trephining. Immediate relief. Lost sight of.

Case 28. M. M., a man 28 years old. Otitis media purulenta sub-*acuta*. Onset of disease six weeks ago, following bathing. Spontaneous rupture of membrana tympani. On account of very small opening in drum membrane insufficient drainage. Trephining under local anesthesia. Immediate relief, copious discharge. Went on the road for three weeks in pursuance of his business. Condition of ear not much improved. On his return to the city was treated for three weeks; much improvement. Opening in drum membrane was almost healed. Left the city again, and on his return the condition of the ear was again found to be bad. Bulging of the upper wall, nipple-shaped, elevation of the drum membrane and on the top a small opening. Insufficient drainage. Mastoid slightly sensitive. Drum membrane trephined for second time. Free discharge. Condition much improved. Shortly afterward ear perfectly healed.

Case 29. R. C., a woman 25 years old. Otitis media purulenta sub-*acuta*. Paracentesis two weeks later. One week later drainage still insufficient; trephining of the inferior posterior part of the drum membrane. Immediate relief. Excised piece of drum membrane found in the hole of the trephine. Following day very profuse discharge. Opening in drum membrane not visible on account of swelling. Mastoid region swollen. Two days later swelling of drum membrane subsides. Hole in drum membrane now visible. The swelling of mastoid has proved to be caused by an otitis externa. Two weeks later ear perfectly dry and healed up.

Case 30. L. S., a man 32 years old. Otitis media catarrhalis *acuta*. Trephining under local anesthesia. Much relieved. Healed after two weeks.

Case 31. H. C., a man 55 years old. Otitis media catarrhalis *acuta*. Trephined. After ten days the discharge suddenly ceased; two weeks later bulging of Shrapnell's membrane with several curtain-like folds in the lower posterior part of the drum membrane in a deep slit, small opening visible from where some pus under great pressure oozes through. Mastoid quite sensitive in the region of the

antrum. Second trephining. Mastoiditis did not subside, had to be operated upon.

Case 32. A. B., 60 years old. Otitis media purulenta chronica. Paracentesis performed twice; small opening. Insufficient drainage. Trephined. Still under treatment.

Case 33. G. S., a woman 60 years old. Otitis media catarrhalis subacuta. Tinnitus. Trephining, practically no pain during the injection of cocain, or at the trephining. Much relieved. Lost sight of.

Case 34. R. A., a girl 23 years old. Otosclerosis left ear. Otitis media catarrhalis acuta after an attack of influenza. Trephined. Drum membrane very easily perforated, apparently unusually thin. Still under treatment.

Summary. There were thirty-six drum membranes trephined in thirty-four patients, twenty-one men, ten women and three children. In the thirty-six ears there were twenty-two O. M. C. A., three Omsubac, five ompa, three ompsubac, one Omcc, two ompc.

Only in two cases of otitis media catarrhalis ac. (Cases 2 and 31), mastoiditis had developed in spite of the trephining of the drum membrane. The unsatisfactory outcome in case 2 was probably due to inexperience and faulty technique in the beginning of this work. In Case 31 the poor result may have been due to the negligence of the patient in the after-treatment. In Case 12 of Omsubac and in Case 16 of Omcc, the effect of trephining was not satisfactory, because trephining has a beneficial effect only in cases where the secretion is copious; and the drainage is made more efficient by the trephining of the drum membrane. The unsatisfactory result in Case 20 of otitis media purulent acuta can be explained by the advanced mastoid involvement, for although at the beginning of the prospects of avoiding a mastoid operation seemed quite promising, eventually one had to be performed. The unsatisfactory outcome in Case 22 was due to the complication in the mastoid, which had already been too far advanced.

In nine cases the ultimate result could not be ascertained, as the patients failed to appear for after-treatment. Three cases are still under treatment.

In looking over the literature I found that Himley advocated the use of a trephine about one hundred years ago, not for the purpose of facilitating the drainage, but to improve hearing. But as the hearing was not improved, by punching out a hole in drum membrane, the trephining of the drum membrane was given up as a useless procedure. In *THE LARYNGOSCOPE* of 1912, Robert Lewis

	Sex	Age Yrs.	Diagnosis	Complication	Anesthesia	Result	Remarks
1.	Man	36	O.M.P.A.	Mastoiditis	Local anesthesia	Good	
2.	Woman	29	O.M.C.A. (both ears)	Mastoiditis	"	Not satisfactory	Had to be operated for mastoiditis. Second ear healed. Lost sight of.
3.	Boy	6	"	"	"	Good	
4.	Woman	25	"	"	"	Good	
5.	Boy	9	"	"	"	Good	
6.	Man	26	O.M.P.A.	"	"	Good	
7.	Boy	17	O.M.C.A.	"	"	Good	
8.	Man	28	"	"	"	Good	
9.	Woman	22	"	"	"	Good	
10.	Man	40	"	"	"	Good	
11.	Man	25	"	"	"	Good	Lost sight of.
12.	Man	48	O.M.C. subac.	"	"	Not satisfactory	Lost sight of.
13.	Man	34	O.M.C.A. (both ears)	"	General anesthesia nitrous oxyd	Good	
14.	Man	53	"	"	Local anesthesia	Good	
15.	Woman	54	O.M.C. subac.	"	"	Good	
16.	Man	34	O.M.C.A.	"	"	Not satisfactory	
17.	Man	25	O.M.P.A.	Mastoiditis	"	Good	Lost sight of.
18.	Man	21	O.M.C.A.	"	"	"	"
19.	Woman	21	"	"	"	"	"
20.	Man	37	O.M.P.A.	Mastoiditis	"	Not satisfactory	Had to be operated for mastoiditis.
21.	Man	49	O.M.C.A.	"	"	Good	
22.	Man	19	O.M.P.A.	Mastoiditis	Local	Not satisfactory	too far advanced
23.	Man	26	O.M.C.A.	"	"	"	
24.	Man	19	"	"	"	"	
25.	Man	20	"	"	"	"	
26.	Man	30	O.M.P. subac.	"	"	Satisfactory	previous paracentesis 1 week before.
27.	Woman	24	O.M.P.A.	"	"	"	Paracentesis in Shrapnells membrane 3 days ago. Insufficient drainage. Later
28.	Man	28	O.M.P. subac.	"	Local	Satisfactory	Lost sight of. Previous spontaneous rupture of membrana tympani. Was trephined twice as on account of traveling ear was neglected. Healed Feb. 26, '16
29.	Woman	25	O.M.P. subac.	Otitis externa	"	Satisfactory	2 previous paracentesis performed.
30.	Man	32	O.M.C.A.	"	"	"	
31.	Man	55	"	Mastoid	"	Not satisfactory	Discharge stopped in 10 days. Two weeks later 2nd severe attack with mastoiditis complication. 2nd trephining but of no avail mastoid operation had to be performed.
32.	Man	60	O.M.P.C.	"	Local	"	Twice paracentesis performed several weeks ago. Still under treatment.
33.	Woman	60	O.M. subac.	"	Local	"	Still under treatment.
34.	Woman	23	O.M.C.A.	"	Local	"	Still under treatment.

advocates the use of a punch forceps to remove a portion of the drum membrane, in order to overcome the inadequacy of drainage which sometimes follows ordinary myringotomy in acute cases of otitis media. This author, however, does not describe the punch forceps, nor the method of its use; whether he grasps the drum membrane at the edge of the perforation, or whether he gets a fold of the drum membrane in the grasp of the forceps; nor does he state whether he employs anesthesia or not, so that the writer is unable to pass judgment upon this method of procedure.

Although it is not expected that trephining will in all cases replace the present form of myringotomy (by paracentesis) with a lancet-shaped knife, still in many well-adapted cases of ear affections especially in subacute or chronic purulent otitis media where the drainage is insufficient its superiority to the present form of paracentesis of the drum membrane will be acknowledged.

Not in all cases will the excised piece of the drum membrane be found in the hole of the trephine. Should the small piece of the drum membrane remain hanging loosely, the trephining will have a good effect, because the circular incision made by the trephine will be better for drainage than the linear incision made by a lancet-shaped knife. I have never seen a permanent opening of the drum membrane after trephining.

60 St. Mark's Place.

Atrophic Rhinitis. A Plea for Operative Treatment. WILLIAM

FERGUSON, *New York Medical Journal*, Vol. CII, No. 22, Nov. 27, 1915.

The author thinks that deflection of the septum and nasal spurs are largely responsible in many cases for this condition. He divides his cases into two groups: (1) Those that will be benefited by operation and upon examination these cases show deflection of the septum and spurs, but when the crusts are removed no pus is seen coming from the sinuses; (2) non-operative, those that show marked atrophy of the turbinates, with heavy crusting and pus in the sinuses. The first group are often greatly benefitted by operative measures. The second group are practically hopeless as far as operative procedures go.

PACKARD.

EDITORIAL DEPARTMENT

THE DEAF

**Their Education—Improvement of Conditions—
Responsibilities and Participation of the Profession.**

JOHN DUTTON WRIGHT, M. A.
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THE RE-EDUCATION OF HEARING IN CASES OF PROGRESSIVE DEAFNESS.

In the January and February (1915) numbers of *L'Infanzia Anormale*, Milan, Prof. L. Castellani, M. D., discusses the above subject with special reference to the so-called oral or voice method, and the instrumental method as perfected in the elaborate apparatus of Zund-Burguet. He recognizes in the Zund-Burguet apparatus "a very ingenious combination which may mean a true progress in the experimental field of the clinic and the physiopathology of the hearing," also "a happy experiment in the field of phonetics; but which in the therapy of those obstinate and rebellious cases of deafness against which all the weapons of otoistics are blunted does not make an appreciable impression." He expresses the opinion that "the acoustic exercises practiced according to the oral method, the classic method of Urbantschitsch still represent the most practical treatment for the deafness unyielding to any medical therapy."

He defines auditive re-education as "that treatment of deafness in which pedagogy is substituted for a medical therapy that has completely and vainly exhausted all its resources, studies the residual sound perception of a deaf ear, and, with continued exercise and making the greatest demand upon the psycho-integrative faculties of the patient, seeks to attain an improvement in perception, improvement that we can compare to a greater sensibility, to a greater degree of excitability of those zones or segments of the acoustic apparatus which, not having been involved in the lesion, still allow

more or less perception. That implies that if the ear is profoundly injured, if the organ of corti participates to all its length in the lesions which have already invaded almost all of the auditive apparatus, even this pedagogic attempt may be omitted, as it will be quite useless. Such an occurrence is exceedingly rare, however, and even amongst deaf-mutes there are fortunately very few cases.

From Ernaud to Itard, and from Itard to Urbantschitsch, the acoustic exercises were gradually perfected, but they always were consistent in employing the human voice as a means of exercise. Only Urbantschitsch thought best to supplement it in certain cases with the "armonic"; only, however, as an auxiliary means supplementary to the human voice. The results obtained by Urbantschitsch with a daily treatment (15 minute sessions) and prolonged for a time that cannot be well determined, were really astounding, taking into account besides that the majority of his subjects were deaf-mutes.

The pedagogic mechanism of acoustic exercises with the oral method is very simple, but requires, as all acoustic exercises do, a great deal of patience on the part of the patient and on that of the curer, who need not necessarily be a specialist. A good teacher of the deaf, who by his apostolate itself, possesses patience in large quantities and knows the fundamentals of the special pedagogy which we call *cofopedagogy*, and those of the physiology of hearing, can accomplish the treatment. Bezold had this treatment followed with those taught. Prof. Ferreri, of the National Institution for the Deaf, at Milan, follows the same method. It is the part of the doctor to watch the acoustic apparatus of the patient and control at certain intervals the results of the cure.

The oral method of acoustic exercise consists in this: one must speak toward the patient's ear the sound or word which he wishes to distinguish, but in such a way that he does not read on the lips of the speaker. The first and more simple exercise must enable him to differentiate the vowels, then the consonants in syllables, then words and phrases, seeking also, in order to render the exercise more profitable, to pronounce sometimes words and phrases seldom used or that have no meaning.

Urbantschitsch says that, to act favorably, the sonorous intensity should be such as to require from him who would hear a certain degree of attention. A too violent excitation might induce an irritated condition and a consequent fatigue of the nerve. The duration of the session must not exceed fifteen minutes, without risk of tiring the acoustic nerve; hence, rather short exercises and made without raising the voice."

Prof. Castellani expresses the opinion that the injury to the voices of the teachers practicing the oral method "is all in the way of applying the exercises and can be prevented by those who use them methodically and wisely."

But to return to the method of acoustic exercises. "Numerous experimenters attempted auditive re-education adopting instruments as exciting means of the auditive nerve apparatus. Dussard, for example, who used his own "amplifying accoumetric apparatus" founded on a modification of the phonograph; the micronograph Marage, and later, Ranjard, of the vocal sirens, and finally Zund-Burguet with his special apparatus, called electrophone or electrophonoid.

It is not necessary for me to dwell on the various methods. I shall only speak of the Zund-Burguet method, as the newest and more perfected of the instrumental methods. Zund-Burguet's aim, to use his own words, has been "to substitute for the human larynx a special apparatus, a sort of mechanical larynx, indefatigable and perfectly capable of regulation."

But there is, in Dr. Castellani's opinion, something more important in the acoustic exercise that the electrophonoid cannot give: "It may give to perfection the sound of the human voice, with the most delicate blendings of the musical scale, but it does not give the vowels; it does not give the syllabic groups, and does not give the words and the phrases." Now, then, it is precisely the vowels that the deaf person must exercise himself in hearing, to be able to attain that which is the most ardent aspiration of the deaf, conversation with the hearing.

The training of an ear to the perception of a laryngeal sound, even if it is mechanically perfected, will always require a new training for words. As the acoustic exercise is nothing but an utilization of auditive residues by means of psychic-integration, no apparatus, even that exquisitely elaborated one of Zund-Burguet, can give the results given by the voice of a good teacher, provided with good vocal and pulmonary organs.

Does the Zund-Burguet apparatus eliminate the inconvenience due to the duration of the cure, and the need of a large dose of patience on the part of the subject and of the curer? I have already expressed my doubts on the subject, a doubt that is increased by the observations of Zund-Burguet, of Hehmoortel, of Richez, of Melzi and others. We see cures protracted through very numerous sessions, and the numerous sessions certainly are a sign of the patience of he who does it and he for whom it is done.

What are the results of this new method? They seem good, but in this, as regards the electrophonoid method, I must base my conclusions on the statistics of others and data which are not always complete, and such as to give the reader an exact diagnostic conception, with very few anamnestic data from which an idea can be had about the condition of the patients nervous system; especially rare are the results of the objective and functional examination of the ear. The authors, in composing their stories, place well in sight their anamnestic data; the patients have pilgrimed from otologist to otologist, and have gone to beg their salvation from the electrophonoid apparatus. Otologists would wish, and I believe legitimately, a greater clarity of exposition of the objective and functional examinations of the ear and of the whole organism, at least in these first works with which they are trying to make known the excellent qualities of a new school."

Histology of Angio-Fibroma of the Nasopharynx. IRWIN MOORE,
Proc. Roy. Soc. Med., Laryngological Section, Jan., 1916.

These growths are composed mainly of dense white fibrous tissue, strands of which may be seen spreading out from their basal origin. These fibers have a tendency to interlace. Scattered about and embedded between the fibers are a variable number of connective tissue cells, in some parts densely packed. These growths also contain a large number of thin-walled blood-vessels and large, cavernous sinuses. Angio-fibroma arise from a broad base in the thick periosteum covered by mucous membrane which lines the roof of the nasopharynx and the body of the adjoining sphenoid. They are firmly attached to both periosteum and bone and are invested with a comparatively thick capsule. In the removal of these growths the author advises approaching them through the mouth and nasopharynx because of the greater freedom of access than through the nose.

P. F.

SOCIETY PROCEEDINGS. NEW YORK ACADEMY OF MEDICINE.

SECTION ON LARYNGOLOGY AND RHINOLOGY.

Meeting of January 26, 1916, Continued.

Occurrence of Lung Abscess Following Tonsillectomy. Report of Nine Cases. DR. MORRIS MANGES.

During the past six months, six patients have been admitted to Mount Sinai Hospital for the treatment of pulmonary abscesses which have followed tonsillectomy. Such a large series of cases in such a short period reserves some notice in these days when every tonsil is under the suspicion of being a possible focal infection in so many diseases of obscure origin.

As a result of the doctrine of focal infections, the number of operations on the tonsils, especially in adults, has been enormously increased, and the change from the simple tonsillotomy to tonsillectomy has naturally necessitated a much more radical procedure in which general anesthesia is usually employed. The large number of these operations had undoubtedly led to carelessness in the performance of tonsillectomy at the public hospitals and dispensaries.

That abscess of the lung may follow, is well known. In a recent paper, I have mentioned this relation, and I also referred to Scudder's experience at the Massachusetts' General Hospital. Scudder has seen several such cases, and he has also treated a lung abscess which followed a nasal operation. Cases have also been reported after adenoid operations, but those are very rare. That they do not occur more frequently after adenoid operations may possibly be explained by the fact that the operation is much shorter in duration and that the patients were children. The venous relations, too, may have some bearing in explaining this difference between adenoid and tonsillar operations.

There is every reason to believe that these post-tonsillectomy lung abscesses are much more frequent in occurrence than the published cases would lead one to suppose. Thus, Yankauer has recently seen four cases, and very striking proof of this statement is afforded by Dr. H. A. Allen, of Indianapolis, whose remarks at the last meeting of the American Medical Association deserve quotation.

The present paper is based on nine cases that occurred at Mount Sinai Hospital during the past year. The mortality was 11 per cent. Many of the patients were very sick; one needed a resection of a lobe of the lung; another had an operation for pneumothorax.

The cause of these abscesses is probably aspiration of blood or tonsillar tissue at the operation. A second possible cause might be embolism from the open veins at the time of the operation or from a septic thrombosis in some small vein in or near the field of operation. This embolic origin is not very probable, because such embolic abscesses always involve many areas in the lungs, as, for example, in post-partum sepsis. The anesthesia itself is not a cause of lung abscess, as bronchitis or pneumonia are the only lung complications after anesthesia.

After discussion of the possibilities and a recital of the history of the nine cases, Dr. Manges concluded that these cases are preventible, and should never occur if the patients are properly examined before the operation; if the operation is carefully conducted so as to prevent aspiration; and, finally, if the patients are kept in the hospital a sufficiently long time (one to three days) to secure proper care and closure of the wound. These abscesses never occur in private patients.

Tonsillectomy in the adult is not a minor operation, and should therefore be performed with the care and attention which its importance demands.

DISCUSSION.

THE CHAIRMAN said that Dr. Manges was to be congratulated on presenting this remarkable series of cases of lung abscess following tonsillectomy. He then called upon Dr. Cornelius G. Coakley to open the discussion.

DR. CORNELIUS G. COAKLEY: (Published in the present issue of THE LARYNGOSCOPE.)

DR. YANKAUEB said he was surprised to hear Dr. Manges quote him as saying he had seen open veins three days after operation. What he had said was that he had seen veins bleeding. One can quite frequently see veins *exposed* in the posterior pillars immediately after the tonsillar operation, and it is quite possible that the blood in these veins may become clotted and become the point of origin of a pulmonary embolus.

It gave him much pleasure to hear Dr. Manges place so much importance on the anesthesia as a possible cause of the lung abscess. The evidence seems rather conclusive that most of these abscesses are the result of the inhalation of blood or infective material during the operation. Cases that he has bronchoscoped were none of them done within a month after operation, so it was not to be expected that blood would be found. The point of view lies in the manner in which the tonsillar operations are done in the city to-day. The Association of Out-Door Clinics has recently passed a resolution that patients who have tonsillar operations must remain in the hospital for eighteen or twenty hours afterward.

Dr. Yankauer said that in his opinion the most important point in these tonsillar operations is the previous preparation of the patient—to be sure that the patient's stomach is free from food, that he has had a cathartic, and that he has taken no food, either solid or liquid, for twelve hours before the operation. This preparation is not carried out in any of the hospitals; the children are admitted and operated within a few hours, and are sent out before twenty-four hours have elapsed. This has to be so, in order to enable the hospitals to take care of the large number of cases which apply for treatment. This same plan had been adopted and is carried out to-day at Mount Sinai Hospital, in spite of his disapproval. He had objected to that procedure, and believes that the patient should be admitted to the hospital the day before the operation and the preparation carried out just as for other patients who are to have anesthesia.

At Mount Sinai Hospital our best anesthetists give their personal service in these tonsil cases. In order to study the matter further, Dr. Yankauer said, he had investigated the state of the anesthesia, and found

that ten per cent, of the patients vomited food during the operation. He believes that the fact that these patients are not sufficiently prepared for the operation is the foundation of these lung abscesses. There is no assurance that the patient's stomach is empty when operated upon. If infectious material is squeezed out of the tonsil, may be partly responsible, the food and the infected mucous aspirated during operation must also be taken into account.

In order to remedy this, it would be necessary to keep the patient in the hospital for at least twenty-four hours and that would greatly complicate the hospital management of this enormous number of cases. It is a matter for serious consideration, and the directors of the hospitals should become aware of it in order to provide the proper facilities.

There is no question of the necessity of tonsillectomy in these cases—no question of the advantages of tonsillectomy over other procedures; but there is urgent need in this city for better facilities for the work. In private practice we have to deal with a class of patients whose average intelligence is considerably higher than is the average intelligence of the hospital patient. In addition to that, they have the personal care of the family physician. Also, as a rule, adults are not operated upon if there is any organic lesion or serious defect without that fact being brought to the attention of the surgeon by the family physician. In spite of the fact that Dr. Coakley is not satisfied with the average examination made before operation, if a private patient is sick, one is very apt to know it. With the hospital patient, it is different. In the Mount Sinai Hospital, the children are examined by the pediatricists, and all those with the slightest degree of temperature above normal are rejected, and any patient who seems to be in a poor condition is rejected. The anesthetic is administered by skilled anesthetists, and the operation is performed with the patient's head hanging over the table, suction apparatus being employed to keep the field clear. It is very important to use aspiration to keep the throat and field of operation clear. What Dr. Coakley had said about the bleeding was very important. The bleeding should be stopped in the first tonsil before the second is operated upon; and all bleeding should be stopped before the patient is allowed to leave the hospital.

DR. CARTER said that when one man representing one service in a hospital brings together nine cases of abscess of the lung occurring within a year, six of them within six months, it is time for those of the profession who are engaged in doing this work to sit up and take notice, and look to their methods. The cases reported are well authenticated. There is no doubt that abscess of the lung does occur after tonsillectomy, and the seriousness of the complications should be freely appreciated and taken into consideration.

The *anesthesia* must play a very important part in the causation of lung abscess. All of Dr. Manges' cases were adults. In doing the operation upon an adult, more time is required to put him under the anesthetic, he is under its influence more thoroughly and for a longer time, and the reflexes are completely abolished. Therefore there is more opportunity for inspiring infective material into the trachea, the bronchus, and bronchioles. It seems more likely that if fragments of tissue are inspired they come from the adenoids rather than from the tonsils, since the latter is

usually removed en masse while the adenoids frequently come away in small friable pieces.

The irritation of the mucous membranes of the respiratory tubes and the walls of the alveoli, due to the anesthesia, predisposes them to the invasion of infectious agents. The position of the patient's head should be lower than the body. Failure to observe this precaution probably accounts for some of these cases of abscess.

Who gives the anesthetic? We know very well, those of us who were hospital internes several years ago, that our first job was that of giving the anesthetic. It is not quite so bad now, but it is nearly so. A man is not in the hospital very long before he is "pushing the dope;" and not only one man, but two or three are doing it at the same time, and each one equally inexperienced. Few of the hospitals have instructors in anesthesia or paid anesthetists—they ought to have them, skilled anesthetists, men who are trained for that work and who do nothing else. The amount paid to the hospital by the clinic patient should insure this precaution being taken for his safety.

Who do the adenoid and tonsil operations? We might as well tell the truth. Dr. Carter said that he had no hesitation in saying that ninety per cent. of the adenoid and tonsil cases in the special hospitals are operated upon by clinical assistants and the members of the house staff; nine and nine-tenths per cent. by the assistant surgeons; and one-tenth of one per cent. by the surgeons. These statistics were not based on actual figures, but this proportion was impressed upon him by long experience and was not far from being correct. If, therefore, a man's hospital title expresses the relative degree of his experience and skill, then these admittedly major operations are, to a large extent, in the hands of those least qualified by experience to perform them. These are conditions over which we have not full control. A man must have experience some time in his life, and he can only learn by doing them himself, by doing them under the supervision of experienced men; but even if an experienced man is present, no two men can operate upon a tonsil and adenoid case at the same time; the man who has his hand upon the instrument is the one who does the work, and the operation is either done skillfully or unskillfully.

As to the number of cases operated upon, we now come to what has been naturally and accurately called "the slaughter of the tonsils." Many cases are operated upon that do not need it. There is not a proper supervision exercised over the cases that apply for operation for adenoids and tonsils. Those who have a large hospital or dispensary service never have a day pass without some parent coming in and saying that his or her child is "suffering from adenoids and tonsils." In all probability, the child has not been seen by a doctor. The operation has become a fad, and the parents have heard from their neighbors that adenoids and tonsils are found in children's throats, that they ought not to be there, and must be taken out.

In the clinics, the history is not always gone into, and operations are performed without assurance, in a scientific way, that the child needs the removal of his adenoids and tonsils; normal pharyngeal and faucial tonsils are not, to say the least, a menace to the individual's health. There is no operation in all surgery that is more frequently performed

without a knowledge of the conditions that make operative interference necessary. In view of the serious complication which Dr. Manges has brought to our attention to-night, if for no other reason, no adenoid and tonsil operation should be performed unless the indications for it are very definite. If this precaution is observed, there will be fewer operations and fewer abscesses of the lung. These various points cover the difference between the treatment of hospital and private patients.

Dr. Carter said he wished to emphasize one point which was brought out very strongly by Dr. Coakley,—the need of a trained corps of men to do this work,—trained anesthetists and trained nurses. This operation is no longer considered a minor operation, and we must give the patient the advantage of the safeguards demanded by major procedures.

Dr. IMPERATORI asked how Dr. Manges explains the fact that with the great number of such operations on children as compared with those on adults there are no cases of lung abscess in children reported.

Dr. YANKAUER said that Dr. Koplik had recently told him that in his service there were three children with lung abscess following tonsillectomy.

Dr. EMIL MAYER said that Dr. Manges had called attention to the possible causes of these abscesses of the lung. The question naturally arises: Why do they occur in the dispensary patients and not in private practice? It would be valuable to have that point elucidated more clearly.

Dr. Manges had also mentioned something which had been lost sight of in the discussion, that is, whether or not we should favor local rather than general anesthesia in the prevention of this inhalation of blood or pieces of tissue. Dr. Yankauer had brought out an interesting sidelight on this point in protesting against the method adopted in Mount Sinai. Dr. Mayer said that he was prepared to accept that method, which was the one adopted by all of the best institutions, and which is the best that has been devised. In all his long experience he had not seen any fatalities follow the method in vogue, which has been carefully worked out. There are special men who do this work, a trained anesthetist who does nothing else, and trained assistants who are careful. None of Dr. Manges' cases came from the clinics of Mount Sinai Hospital. The reason is, they don't operate on adults in Mount Sinai; they have not room to keep the patients long enough, and local anesthesia has been forbidden. The authorities after going into the question of using local anesthesia have concluded that it was not humane and have discontenanced that method in old and young.

The entire question is one of tremendous interest, and laryngologists ought to be grateful to Dr. Manges for calling attention to results that may follow this operation, for no one knows but that some serious result may follow what the layman and some of the profession consider a minor operation. He hit the nail on the head in calling it a major and not a minor operation.

Dr. GUTTMAN said that all agreed that the subject was a most important one. One point, however, he thought had not received sufficient stress. What is the cause of all these complications? In many instances, as Dr. Yankauer had said, the patients are not properly prepared, and have not only infective material in their throats, but vomit food during the operation. One thing was common to all the cases reported, that is

general anesthesia. One cannot get away from that. All the other conditions might be different, some cases might have more skilled assistance, others might have less bleeding, but all the cases were operated under general anesthesia. Why should that not be considered one of the most important factors in causing these lung abscesses? Some time ago a letter had been sent to all the members of this Section, asking whether local or general anesthesia was to be preferred. Only a small number of replies were received, but the majority of those approved general anesthesia in all cases. Dr. Mayer had stated that Mount Sinai Hospital prohibited the use of local anesthesia. It would be interesting to know what authorities decided that,—who, with the exception of the attending surgeon, had the authority to prohibit or permit the use of any anesthetic in any case.

In his own practice he uses in the majority of cases local anesthesia for adults. His experience extended over twenty years, and he had never had any bad results, and he believed that this was to a great extent due to the fact that he does not invariably use general anesthesia. For children also he uses local anesthesia wherever possible. If there is an adult who cannot stand the operation under local anesthesia, he had better run the risk of his local infection than that of a mediastinal abscess.

Dr. Manges had not taken up the statistics of the fatal cases resulting from tonsillectomies. Dr. Guttman said he knew of a few instances within the last few years where the patients remained on the table after the operation under general anesthesia. The best method of operating on these cases is not yet fully settled but the question is still open for further consideration.

DR. HASKIN said that he considered the tonsil and adenoid operation a most important one, and for his own part would rather operate a dozen mastoid than one tonsil and adenoid case. Dr. Yankauer had spoken rather lightly of one point which in Dr. Haskin's opinion is of the greatest possible value in avoiding these lung complications, and it seemed strange that all hospitals do not have their operating rooms equipped with a suction apparatus of some kind. It keeps the operative field absolutely clean during the entire operation. Dr. Haskin said he had talked on this subject for a number of years, and had devised such an apparatus himself, which he found invaluable. With it one can stop a bleeding point in a jiffy and find out just what is the condition, but many of the hospitals will not spend the necessary fifty or one hundred dollars. Ninety or ninety-five per cent. of these cases of lung complications could be avoided by keeping the throat clean; but putting in a big piece of gauze and swabbing and blocking up the field is not giving the patient the best chance, and furthermore when the gauze is taken out, the first aspiration sucks in the blood. Much of the danger would be removed if all the operating rooms were equipped with some suction apparatus.

Dr. Wilson said that he operates in a general hospital and always uses a suction apparatus. He did not believe that the method of anesthesia has anything to do with the lung abscess, for many general emergency cases are anesthetized and have to be operated upon immediately and do vomit, and do it much more often than the cases of tonsillectomy; most of the cases for tonsillectomy have been prepared by having a cathartic and have been deprived of food for several hours. He agreed with Dr.

Coakley that it was the bacteria from the tonsil which was responsible for the infection, rather than the vomited food or the anesthesia.

DR. LILIENTHAL said that his interest had been awakened on this subject because he had operated upon some of the cases reported by Dr. Manges. He had concluded that while lung abscess might follow operations other than tonsillectomy, it is most frequent as a sequel to this operation. He had operated in children as well as in adults.

In view of the fact that a general anesthetic completely abolishes the throat reflex the aspiration of septic material is much more likely to occur than it is in operations of a similar nature performed with local anesthesia. He had therefore concluded that barring certain exceptional cases, it would be better practice to perform a temporizing operation, the old-fashioned tonsillotomy, in childhood and to postpone the radical tonsillectomy until the patient was old enough to submit under local anesthesia and he had followed this plan in the case of his own children. He had not seen a case of lung abscess following tonsillectomy in local anesthesia. This might be perhaps because so few patients are operated upon by this method, but it appears reasonable that with the abolition of reflexes and consciousness we lose the safeguard of reflex expulsive coughing during the operation. He had seen two cases of lung abscess following operation in distant parts of the body, one of them being an appendicitis, the other a case of gall stones.

DR. COAKLEY, referring to the point made by Dr. Lilienthal in regard to lung abscess in adults following tonsillectomy, said that Dr. Scudder, of Boston, had reported sixteen cases of lung abscess, only one of which was operated upon for a condition in the upper respiratory tract, *viz.*, deformity of the nasal septum. There were fifteen which were not tonsillectomies, but following operations with general anesthesia. Dr. Lilienthal does not take a sound view, when lung abscesses are so frequent as Scudder reports following operations under general anesthesia. The proper influence would be not to use it for such cases, but do them all, operations with local anesthesia.

DR. LILIENTHAL replied that such is the tendency to-day.

Referring to the suction apparatus, DR. COAKLEY said that it was only another instrument in the mouth. If the tonsils can be removed with the loss of less than a dram of blood from each of the two tonsils in children, and not more than two drams each in adults, he saw no need of suction.

DR. LILIENTHAL said that while he admitted the comparative lack of experience which he possessed, when he considered the very numerous cases which are observed by the specialist, he could not help feeling as he did about the matter. He did not know what was the proportion of operations for tonsils and adenoids in the Massachusetts General Hospital when compared with the total number of operations in the Surgical Service. It was his impression, however, that lung abscesses occurred more frequently after operations upon the throat and mouth than after operations on other parts of the body.

DR. VOISLAWSKY said he had formerly thought that most of the pneumonias and deaths that occur were the result of the anesthesia, and it was only recently, after hearing Dr. Yankauer and Dr. Manges speak at the meeting of the County Society, that he had begun to think they might

be due to errors in technique. The various points brought out by the speakers of the evening seemed to confirm this view. In the hospitals with which he is connected they do employ suction. It is used at the start of the operation to get rid of what saliva or mucus may be in the mouth. In proceeding with the operation, a tail-sponge is used. It is saturated in a two per cent. solution of alcohol and placed behind the tonsils, and it is surprising to see how much matter was crushed out of the tonsils when the snare was tightened up. A snare was put first over one tonsil and then a second snare over the other, and both were taken out together. One can have a stick sponge and can put the gauze under the tonsil if he is operating on one at a time. The first time that he used the tail-sponges in this way, the patient happened to be an adult. The two tonsils with the tail-sponges were brought out at the same time, and the quantity of material brought out on the sponge was surprising. If the same, or even half the quantity is crushed out of the tonsils in every operated case, it is not surprising that particles are inhaled.

DR. SCRUTON stated that the occurrence of six cases of lung abscess following tonsillectomy, during a period of a few weeks, in an institution of unquestioned standing must be due to some unusual circumstances. In his opinion, this series of cases was caused by a faulty technique on the part of the person acting as sponging assistant during the period in question, resulting in an inspiration of diseased particles.

DR. IMPERATORI said that he happened to know something about one of the cases, and that in the series of cases operated upon about the time in which the case mentioned was operated, he had not allowed sponging. The second tonsil being removed before there was any bleeding to speak of from the site of the first tonsil. He thought that the condition of lung abscess was probably due to aspiration of blood and septic material squeezed from the tonsil.

DR. DWYER said that it would be interesting if Dr. Manges were to go into the matter of how many cases of lung abscess occur following mastoid operations under general anesthesia. He himself was also connected with the hospital referred to, and probably more of these operations are done there than at any other. They have been running double-handed clinics and operating on about thirty patients a day. There is always on hand a nurse who has been assisting for years. The matter had been under investigation, but he had not heard what conclusions were reached. The general anesthesia may have something to do with it, but how many of these cases occur out of the thousands of cases that have been operated? Dr. Coakley had referred to a physician who had died some time ago, but his history was bad, and he had his tonsils taken out because he was getting worse all the time. A blood culture was made a couple of days after the operation, and it was swarming with bacteria. He was urged to have his tonsils taken out, but only did so after having had attack after attack of tonsillitis. He was probably septic when the operation was performed.

Cause: It all lies in abolishing the reflexes, not so much in squeezing out the organism. The reflexes are abolished, and the secretion finds its way into the lungs. The proportion of septic material carried through the veins must be very small. He knew of case after case of lung abscess where no operation was done.

The crux of the situation was to get all the statistics of all the thousands of operations and find out if the proportion is higher. If after any general anesthetic, either in a child or in an adult, the patients get up a pneumonia and are cured, and then an abscess comes on, is that to be ascribed to the tonsillectomy? We have had it after mastoid operations, but it never became septic as far as the mastoid was concerned.

As to what Dr. Scruton had said, he considered that a reflection on the nurses, for the head nurse had been in charge for a number of years, and she breaks in every nurse that does this work.

Dr. MANGES, in closing the discussion, said he was very glad he had come and read his paper. His object was to call the attention of the laryngologists to the other side of the picture and to try to have them follow up the cases after they are operated upon; and he wished to direct attention to a number of points that have escaped notice in these routine operations. If the statistics could be obtained, he would be very glad to make use of them.

In the paper just published by Dr. Wessler, he makes the statement that 28 per cent. of the cases of pulmonary suppuration that came to the x-ray department of Mount Sinai Hospital were due to tonsillectomy. If 28 per cent. of these cases are due to tonsillectomy, in all probability it means a large percentage of faulty care that needs correction somewhere.

Dr. Manges expressed his indebtedness for the very full discussion of the paper and said he had learned a great deal from it. Dr. Coakley had brought out an extremely important point which was also emphasized by other speakers, that was, that one of the factors was probably the substance squeezed out of the tonsils. That was an extremely important point which he had overlooked entirely.

Another important point was brought up by Dr. Yankauer,—the 10 per cent. of patients who vomited food at the operation.

These two points put together would explain much.

The discussion had brought out one point on which all were unanimous, i.e., that aspiration was the great factor. If that is so, then it is something associated with the operative technique.

The question of local or general anesthesia was one which the men who work in this special field must decide for themselves, but those who had said that the anesthesia was not at fault were on his side, for he had brought that out and had said that if one considers the complications after abdominal operations they would be found to be the same, whether under local or general anesthesia. The refrigeration of the lungs has nothing to do with it. Where aspiration occurs, the refrigerated lung may be a predisposing factor, but there must be an added factor of aspirated matter. Something is aspirated, and if care is exercised to see that the operation is done properly,—by posture, by a trained corps of assistants, as Dr. Coakley described, or by something which the average patient does not get, that will be the great point corrected as the result of this discussion.

Dr. Coakley had asked what should be considered a proper examination. Dr. Manges said that it should be the taking of the temperature, and the examination of the heart and lungs, as well as the urine; for among the cases reported by Dr. Bassim were two which were operated upon when developing scarlet fever. If these patients had been properly examined they would not have been operated upon.

